CONTRACTORS and ENGINEERS

AGAZINE OF MODERN CONSTRUCTION OCTOBER 1961

ting a prestressed tee from the form"

low to make winter pay off

Spotlight on
PRESTRESSING

1962 DODGE HALF-TON PICKUP

ANNOUNCING THE 196

FROM 1/2-TON PICKUP TO DIESEL POWER, Dodge trucks for 1962 feature more than 50 engineering advances to make them tougher, more tight-fisted. ■ And they're on display right now at your Dodge dealer's, priced to compete with every full-size truck rolling the road. ■ Whatever your trucking job, there's a tough Dodge to do the job better, faster, more economically

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CONTRACTORS and ENGINEERS

MAGAZINE OF MODERN CONSTRUCTION

OCTOBER, 1961 — A Buttenheim Publication

Prestressing today and tomorrow

Engineering to reclaim a wasteland

Winter work: Here's how they do it

Equipment maintenance dept.

COVER:
A big tee—8 feet wide and with a 3-foot stem—is being lifted from a stressing bed by a Travelift at the plant of Eau Claire Stresscrete, Inc., Eau Claire, Wis. Giant tees are produced up to 107 feet in length in Valley Mfg. Co. forms for the roof of a new high school in the city. The plant also turns out Y columns and prestressed keystone roof joists for the job.

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Associated Publications

The American City | OVERVIEW | MART | Municipal Index | AMERICAN [illegible] AND BUILDER

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In next month's issue

From 75,000 to 80,000 cubic yards of concrete is being placed per month for Flaming Gorge Dam on the Green River in northern Utah. The average rise is nearly 40 feet per month. How the contractor scheduled work and deliveries to make most effective use of the small storage area is told by field editor Ralph Monson.

• • •

A cost of $3.16 per square foot for a long-span concrete dome is a pretty good figure in building construction these days. It was achieved by Lewis Construction Co., Anderson, Ind., for the Warner Auditorium in the city, and the firm handled the job while keeping within the agreed cost for the structure. A number of types of building—steel-truss roof, geodesic dome, and wood arches—were all investigated before being discarded as too expensive to keep the job within the desired cost range. The company finally came up with the idea of forming the dome on a plastic-sheathed mound of gravel and raising it into position. Plenty of cost-cutting short cuts were used on this job; for instance, the bank-run gravel was not bought, it was merely borrowed and then returned. This cost $22,000 as against a cost of $60,000 for renting scaffolding that would have supported a quarter of the dome.

• • •

Post-tensioned concrete caissons are being used to tie back a retaining wall on the Detroit Expressway, and the complicated job is being done within a 7½-foot-wide trench while some 80,000 cars roar by daily. Field editor Bill Allen gives construction details in an on-the-spot report.

• • •

An article on preventive maintenance of gyratory crushers, with suggested daily, weekly, and major check lists, is next month's Maintenance Dept. feature. This regular department also includes brief tips on care of your equipment.

• • •

In C&E's engineering department: A new supermarket under construction in Poland has a side elevation that resembles a bending moment diagram. Architects and engineers blended art and science in the roof-support design so that it graphically illustrates their engineering calculations.

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Editorial

Plan your winter, now

While the ice, snow, and storms of winter may still lie some weeks ahead—construction men wish they would never come—it is not too early to prepare for such weather. Few areas of our country are spared some adverse cold weather, whether it comes in big or little doses. Contractors who are planning to work through the winter, or even a part of it, need to devote a little extra time to planning their jobs. Highway departments with snow and ice problems must get their equipment and materials in readiness for the first snowfall.

Last winter was more severe than usual, particularly in the middle western and northeast sections of the country. Heavy snowfalls and extreme freezing temperatures made it impossible to work on many projects. On-water jobs, such as the Chesapeake Bay bridge and tunnel, were slowed by many days of high winds raging in from the Atlantic Ocean. There is not much the contractor can do when the elements beset him so.

Ironically, during the eight best weeks for construction in July and August, practically all operations involving the use of concrete in the New York metropolitan area were shut down because of a strike of ready-mix truck drivers. Those two lost months of summer will be difficult to make up, no matter how hard and how late into the season everyone works.

But now is the time to check those salamanders, space heaters, windbreaks, and enclosures. Are your means of heating water and aggregate in good shape? Have you plenty of straw and insulation on hand to protect concrete after it is placed in the forms? Are your operators and equipment properly winterized as to clothing and protective shelter? Have you enough of the right kind of antifreeze in stock? Also the proper grades of oils and lubricants? These are just a few of the questions you should be asking yourself as you plan for the winter ahead.

Highway departments must get ready to cope with snow, sleet, freezing rains, and high winds that produce drifts. Have they enough modern equipment of their own to keep the roads open, or must they get more of the latest plows, trucks, spreaders, etc.? Are their supplies of chemicals and abrasives ample to see them through a tough winter? Do they have enough men, or at least know where they can quickly recruit more as needed?

If these physical needs are adequately met, the highway department cannot stop there. It needs also to assess its preparations for dealing with the public—for handling traffic in a storm.

First of all, it must give the public, through newspapers, radio, auto clubs, etc., information about the storm and whether roads are passable. If cars are stuck or abandoned on the highway, provisions must be made for their removal. Property owners should be educated not to shovel snow back into the roadway after it has been plowed. Special parking regulations may have to be put into effect in order to keep vehicles moving. Certain areas may have to be declared off limits to all vehicles except those of an emergency nature in the interest of public health and safety. Such a regulation was invoked in parts of the New York metropolitan area last winter when only a narrow lane could be plowed through huge drifts for the passage of food and fuel trucks, and for police, fire, and ambulance vehicles.

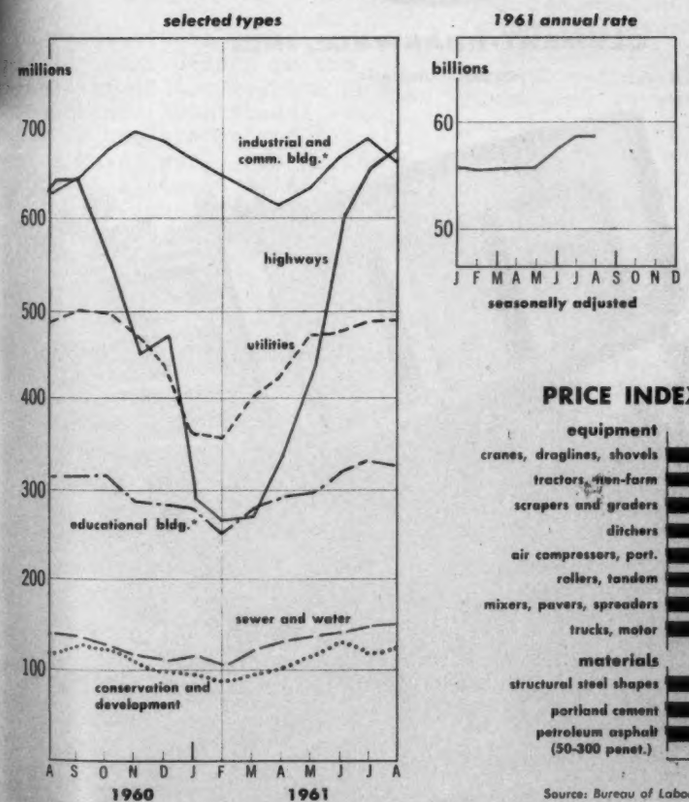
No, it is not too early to give some thought to what preparations are needed to carry on through the coming winter. Better be prepared.

Industry Trends

DOLLAR VALUE OF NEW CONSTRUCTION

Recent Monthly Trends

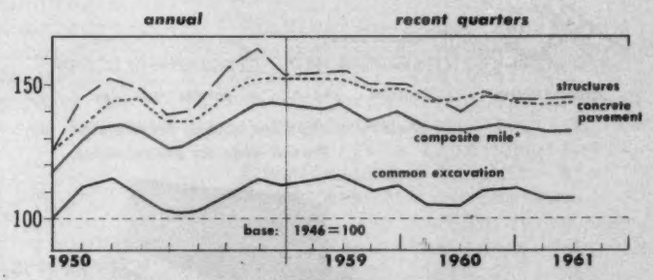
(current dollars)



Source: *Bureau of the Census* *public and private

AVERAGE BID PRICES

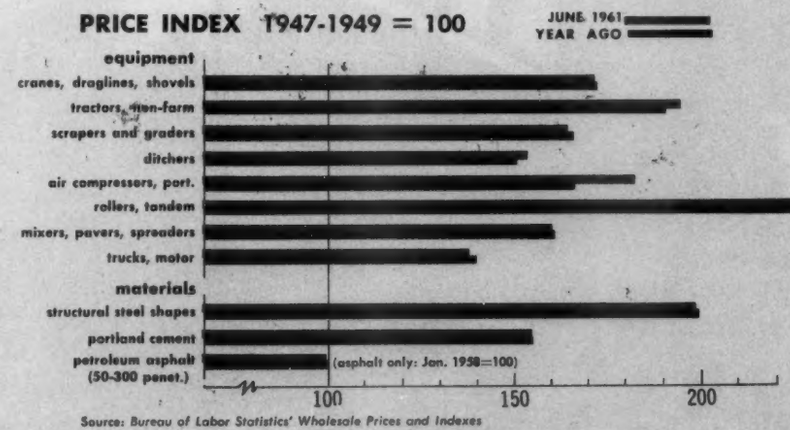
Federal Aid Highway Construction



*Composite mile:=17,491 c.y. exc.; 3,726 s.y. paving; 16,000 lbs. reinf. steel; 4,325 lbs. struct. steel; and 68 c.y. struct. conc.

Source: *Bureau of Public Roads*

PRICE INDEX 1947-1949 = 100



Source: *Bureau of Labor Statistics' Wholesale Prices and Indexes*

Surveying Washington . . .

by E. E. Halmos, Jr.

For construction men foreign affairs, schools, and a public-vs.-private power fight took the spotlight as an increasingly balky Congress moved toward adjournment in mid-September. Heavy Administration defeats on foreign and school-construction aid meant changes in the construction picture. The omnibus public-works bill involving more than $3.6 billion of construction money was held up to the very last.

The sudden House action in chopping more than a half billion out of foreign-aid appropriations (following hard on the defeat of the borrowing-authority request) included substantial cuts in funds for development loans and grants. This has to mean reduction within a year or so in construction spending abroad, even with the restoration of some money by conference committees.

But Congress did approve one foreign-affairs matter of special interest to construction: the Foreign Assistance Act provides some insurance against "political" risks in doing business abroad. This coverage is limited to war, inconvertibility of currency, or expropriation.

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On roads, there was good news for contractors in the release of $818.6 million second-quarter (1962 fiscal year) funds to the states for federal highway work, and in the complete allotment of $3.1 billion for use in 1963. The second-quarter money can be

drawn upon by the states to pay bills; the 1963 allotment is in reality assurance that the funds will be forthcoming. This permits orderly planning and contract letting well into next year.

Some New Mexico road contractors got a break with the lifting of part of the freeze put on the state's funds after scandal investigations this summer. The Bureau of Public Roads restored the authority of the state to approve plans and call for bids, but will pay only 75 per cent of progress claims on projects still under investigation. Contractors named in the recent investigation are still black-listed.

In a move to protect itself and the federal taxpayer against new scandals, BPR has appointed five "program evaluation officers" to check into highway programs in all 50 states. Their job will be "investigation of any known or possible irregularities that may appear." Four are former FBI special agents; the fifth was an investigator with the General Accounting Office.

Congress is finally moving to eliminate an anomaly in BPR—the title of "commissioner." The commissioner has been in an uncomfortable position ever since the passage of the 1956 highway act. By law, he is head of the BPR, but in fact he is deputy to the highway administrator. A proposal before Congress would eliminate the title and make it "deputy administrator."

• • • •

The Army's Board for Rivers and Harbors has gone ahead with recommendations for some 18 new civil-works projects, or modifications, that will cost more than $316 million. These will be submitted for possible inclusion in the next budget requests.

• • • •

Congress isn't much interested in spending any more money to find out whether the United States should adopt the metric system of measurement. A bill to appropriate $50,000 for another study was buried on the House floor when Congressmen wanted to know why any more investigation was needed. They suggested that Congress could simply ask the Bureau of Standards for a report.

• • • •

The final defeat of even vestiges of the Administration's school proposals came as no surprise, but the size of the vote against the whole proposal was stunning—opponents mustered a 73-vote margin. Then they capped the matter by voting the "impacted area" program as a 2-year measure, thus removing it as a possible peg for broadening amendments next year.

Of course, this defeat does not kill the school area as a major market for construction. Voters in local school districts approved construction bonds totaling $443 million for secondary and elementary schools, and $9.8 million for colleges and other educational institutions, in the first six months of this year. Aid to colleges also continues at a high rate through other programs.

• • • •

There could be a new market for construction in moving schools out of the path of noise from jet planes. Residents of a community next to Andrews Air Force Base, near

Washington, D.C., took sound recordings at their school and proved that the teachers' voices were inaudible a great part of the time, lost in the roar of jets from the base. They demanded that the Air Force pay for moving the school. The Air Force is unhappy about the idea, but Congressmen liked it and ordered the Interstate and Foreign Commerce Committee to study the whole problem and to report back next year. (Meanwhile, students will apparently be taught between takeoffs.)

• • • •

Just how big a chunk of the construction business is being taken up by pipeline contractors is indicated in figures released by the Federal Power Commission. FPC says that in fiscal year 1961 (which ended June 30) it had approved applications for construction of $852.2 million of natural-gas pipeline facilities—an all-time record. The total represents the laying of 6,000 miles of new pipeline.

Labor Review

Concrete truck drivers in New York City end 8-week strike

The 8-week strike of ready-mix concrete truck drivers against the New York City construction industry ended as members of Teamsters Local 262 voted to accept a 2-year contract.

The strike, which began July 1, forced into idleness more than 50,000 building-craft workers in the metropolitan area. It was estimated that one-half to two-thirds of the construction work in the area was halted by the strike. The "back to work" vote was 623 to 448.

The new contract provides a 50-cent-an-hour increase, to be distributed to the union membership in

wages and fringe benefits. The union also gets one day of paid sick leave for each thirty days of employment, with a limit of three paid sick-leave days a year. Other improvements were in job security and seniority.

The union, however, foregoes an offer of two hours' pay for those whose names are posted for work the night before but who fail to get a work assignment the next day. This offer had been tied to the previous industry proposal of 32 cents an hour in wages and fringe benefits that was voted down by the union membership.

The new contract will run to June 30, 1963.

Capital contractors work out agreements with three trades

Wages and working conditions for construction workers in the metropolitan Washington, D. C., area were completed through 1963 as the cement masons, rodmen, and teamsters put their signatures on 2-year agreements with the Construction Contractors Council.

Contractors agreed to add a total of 25 cents an hour, in three steps, to wages paid cement masons, according to the council's report. The initial 7½-cent increase, which was effective on the first full pay period on or after August 1, brings the hourly rate to $3.85. Another 7½ cents will be added to wages January 1, 1962, with the final dime due May 1, 1962. Contractors will also continue to contribute 10 cents per hour per employee into a health-welfare fund.

Rodmen also will get a 25-cent hourly pay boost over the next two years, plus 5 cents more for pension coverage. The 2-year agreement backdates a 10-cent increase to the first full payroll period after July 1, 1961, establishing an hourly rate of $4.10. Wages are due to go up another five cents on January 1, 1962, and 10 cents more July 1, 1962. Contractors will increase the present 5-cent hourly pension contribution to 10 cents January 1, 1962.

The 2-year agreement negotiated by the teamsters and the council put a July 1, 1961, effective date on the initial 7½-cent increase and schedules a 5-cent increase for May 1, 1962. The health-welfare contribution of 5 cents an hour went up 2½ cents, to 7½ cents, on September 1.

Southern Illinois engineers agree on contract backdated to February

After six months of negotiating, the Associated General Contractors and Operating Engineers' Local 318 agreed on a 3-year, 35-cent contract raising wages and establishing a health-welfare program for engineers in 14 southern Illinois counties.

The settlement was backdated to February 1, 1961. Wages go up 2½ cents an hour the first year, another 15 cents in 1962, and a final dime in 1963, AGC reports. The 7½-cent-per-hour health-welfare contribution becomes effective with the signing of the contract, AGC adds. A separate classification is established for river and levee work on the Mississippi and Ohio rivers.

The contract covers work in Alexander, Franklin, Gallatin, Hardin, Johnson, Williamson, Pope, Pulaski, Hamilton, White, Massac, Saline, Union, and Jackson counties.

Board upholds engineers' refusal to bargain with multi-employer group

The Labor Board reversed Examiner William Spencer's finding that refusal of Operating Engineers Local 701 to bargain with the Cascade Employers Association of Portland, Ore., as a multi-employer bargaining representative was a Taft Act violation.

NLRB also refuses to accept the examiner's recommendation that Local 701 be found to have violated Section 8 (b)(1) (B) of the act by

restraining and coercing five employer-members of Cascade in selecting the association as bargaining agent.

Spencer concluded that the history of collective bargaining between the operating engineers and Cascade, and the union's failure at any time during the negotiations to raise any question of the association's capacity to bargain on behalf of its members, required Local 701 to bargain with Cascade as a multi-employer unit.

Admitting considerable doubt as to whether certain employers were members of the association, Spencer noted, however, that the five employers picketed by the union were bona fide members of Cascade. He concluded that the union's attempt to force the employers to break off from the association and execute individual contracts violated the act.

The board says Cascade cannot be held to have succeeded the Concrete Products Manufacturers, Inc., an association to which many of the later members of Cascade belonged, because the scope of the two groups was different.

Five building trades sign new agreements in Atlanta area

New agreements were wrapped up by Atlanta contractors with the bricklayers, cement masons, plasterers, carpenters, and laborers.

Bricklayers will get a total wage increase of 30 cents an hour over the next two years, with the first 5 cents due immediately, according to a union official. Another dime is due January 1, 1962; 10 cents more on July 1, 1962; and a final nickel January 1, 1963. The initial increase establishes an hourly rate of $4.05 for bricklayers.

A 2-year, 30-cent package also was approved by Atlanta contractors and the carpenters. A 10-cent hourly increase became effective August 9, bringing the rate to $3.45 an hour. Carpenters will get a 5-cent increase January 1, 1962, and 15 cents more on October 1, 1962, the union reports.

Three-year settlements between contractors and the cement masons, plasterers, and laborers freeze wages for the first year and add a total of 25 cents an hour to wages in the final two years of the agreements. Current rate for cement masons is $3.40 an hour. Plasterers receive $3.55 an hour, while laborers are paid $2 an hour. The three crafts will receive a 10-cent increase July 1, 1962; 5 cents more on January 1, 1963; and a final dime on July 1, 1963.

Examiner finds shutdown by Illinois contractors not an illegal lockout

When a construction union ignores requests to extend an old agreement giving assurance that it will not call a strike pending negotiations on a new contract, with wage boosts and other benefits to be retroactive, a temporary shutdown of operations by the employers does not amount to an illegal lockout, when consideration is given to the economic problems of the industry.

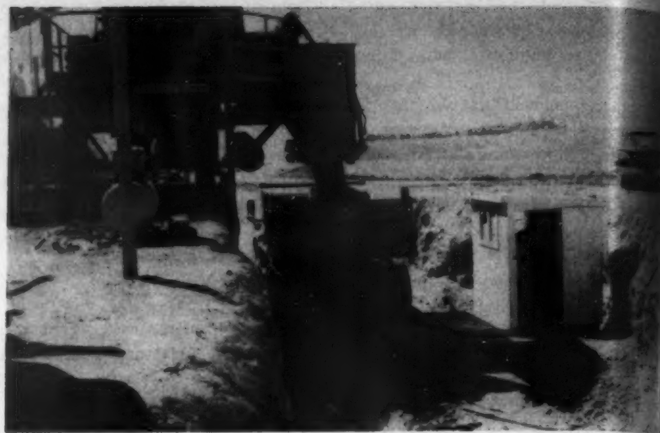
This conclusion was reached by Examiner Lee J. Best in recommending that the National Labor Relations Board dismiss unfair labor practice charges filed by Local 150 of the operating engineers against the Building Contractors Association of Rockford (Ill.), Inc.; Northwestern Illinois Contractors Association; their members; and some contractors who are not members of either organization.

The employers in this instance were found to have bargained in good faith with the union, to have made new contract proposals, and to have offered to continue negotiations toward new agreements. They had reason to believe that the union might call a strike at any time. This not only would have affected construction on a number of buildings, commercial and institutional, and hit highway construction with attendant effect on the public, but also would have prevented the contractors from estimating on other work requested of them since they would not be able to assure uninterrupted work or measure payroll costs for bidding purposes.

Making these findings, the examiner said they are factors that distinguish the instant situation from those cases where NLRB and courts have ruled that employer shutdowns were illegal lockouts. Those employers in similar bargaining circumstances did not have reasonable ground to believe the unions would call sudden strikes, and the unions had given assurance that no strike was "imminently contemplated."

On the other hand, the examiner said, the instant case appears to be governed by rulings where the Board "has held that lockouts are permissible to safeguard against unusual operational problems or hazards or economic loss where there is reasonable ground for believing that a strike was threatened or imminent."

Loading trucks on scales saves stop for weighing



Loading trucks with bituminous-concrete or cement-treated-base mix while they were standing on a scale provided a contractor with two advantages. First, he saved time because the trucks did not have to make a second stop for weighing. Second, the trucks could be loaded right up to the legal maximum load without danger of overload.

On the bituminous paving of Interstate I-90 just north of Sheridan, Wyo., last summer, the Bighorn Construction Co., Sheridan, used this trick at both its CTB and hot-mix plants. Both of these plants were of the continuous-flow type. The hot-mix plant was a Pioneer Continuflo unit, and the base plant had a Barber-Greene continuous pugmill mixer.

Both of the mixing units were set up so that the trucks loaded in pits under the discharge hoppers. Instead of using the usual narrow, single-roadway pits, the contractor scooped out large enough pits to accommodate scales and scale houses.

A Murphy 50-ton truck scale was set up under the discharge chute of the CTB plant, and a 25-ton Fairbanks-Morse scale was set in a similar position at the hot-mix plant. Both of these scales were equipped with self-printing beams.

As the truck drove onto the scales, the tare weight was taken, and the beam was set for a weight just a few hundred pounds less than the maximum legal weight for that vehicle. The plant operator then began filling the truck box with material. When the preset weight had been reached, the scale beam actuated a switch that sounded a bell, warning the operator to shut the discharge gate. In the few seconds that it took him to respond to this signal the truck would be filled right up to the maximum.

The scale man handed the driver the weigh ticket for the load and the truck was on its way. There was no second stop for weighing, no danger of exceeding the legal weight limit, and no time and material were wasted in unloading a surplus.

In the picture above, a Ford truck on the Murphy scale is loading cement-treated-base material from the Barber-Greene continuous pugmill mixer of the CTB plant.

Truck-mounted cabinet for field testing

Inspectors of the Michigan State Highway Department speed up their testing of soil densities by doing the job on the spot. The equipment is conveniently located in a cabinet at the rear of their pickup truck.

The 2-foot-deep wood cabinet contains compartments for two different scales, a 2-burner gas stove, and a water-balloon device for measuring the volume of a hole. The scales and stove are securely fastened to the cabinet to prevent damage. Both scales and stove are used in place. Gas is supplied to the stove from a bottle on the Chevrolet pickup.

Inspector John Swanson, in the photo, is working up the results of a density test on a convenient "pull-out" board. The writing board slides back in to allow the doors of the cabinet to close. Swanson was at work on a relocation of a highway in Michigan's Upper Peninsula.

Driving ground rods made faster, safer

A contractor devised a time-saving method of driving ground rods during the construction of Consumers Nuclear Power Plant at Charlevoix, Mich.

The 20-foot-long solid copper rods carry electrical charges to ground. Normally, it is necessary to build scaffolding to jackhammer the rods into the earth. With the method devised by Bechtel Corp., San Francisco, prime contractor on the project, the scaffolding is no longer necessary. The jackhammer operator works from the ground.

The shaft of the jackhammer is clamped to the side of the ground rod. After the rod is driven down several feet, the clamps are released, and then moved up on the rod. The connection between the hammer and the rod is made by welding a ½-inch steel plate to the shaft of the hammer. Two Crosby clamps, normally used for wire cable, are holed through the opposite side of the steel plate. The clamps grip the ground rod. Loosening the bolted connection of the clamps allows the jackhammer to take a higher "bite" on the ground rod.

Because the operator of the jackhammer works at ground level, the method is less hazardous than that using scaffolding. The new method also gets the job done faster.

Business Comment

The prestressing business

A versatile and economical product, modern and efficient production facilities, and continuing technical advances have made the prestressed-concrete industry the fastest growing segment of the heavy-construction market over the last decade.

From five or six in 1950, the number of fixed-plant manufacturers of prestressed concrete had increased to 205 by the end of the decade, and the market has been growing fast since then.

A government survey* found only 16 plants more than seven years old. Fifty-four per cent of the plants had been in operation less than three years.

About one-third were engaged solely in fabrication of prestressed products. Half were also engaged in the design, engineering, and erection phases.

Most producers also manufactured concrete block, brick, pipe, or ready-mix concrete. About one-quarter were in other related fields, such as sand and gravel operations, aggregate production, and road building.

Plants were found to be typically moderate in size, with none having more than 200 employees. However, one-fifth of employment was accounted for by the 10 largest plants, each of which employed more than 100. The largest annual volume of shipments reported by any plant was well below $10 million.

Total annual shipments of prestressed-concrete products rose during the '50's from practically nothing to $102 million. And this does not include prestressing done on the job site with portable equipment—a practice particularly prevalent in the West and Southwest.

Operations of the fixed plants alone required 90,000 tons a year of high-tensile steel wire, strand, and rods and an estimated 45,000 tons of steel in conventional forms, such as reinforcing bars and welded-wire fabric. The 205 fixed plants also used 1,200,000 cubic yards of concrete a year, most of it high-early-strength. They consumed 1,900,000 barrels of portland cement and nearly 1,900,000 tons of aggregates, in addition to large quantities of ready-mix concrete.

Moreover, as it grew, the industry generated a demand for new specialized equipment: casting beds, including steel forms; fasteners and hold-down devices; hydraulic jacks and gages; as well as conventional cranes, front-end loaders, and transit mixers. A typical fixed plant also requires an investment in a batching plant, a storage yard, and office facilities. An individual prestressing plant represents an investment ranging from $100,000 to $5 million.

First bridge in '51

The nation-wide upsurge in superhighway and toll-road construction during the '50's provided a growing market for standard prestressed bridge beams and shapes. The first use of prestressed concrete reported in this country was on a 1951 bridge project near Hershey, Pa. This was a 24-foot span erected with prestressed beams laid side by side to a width of 22 feet. By 1959, the Pennsylvania Department of Highways had built more than 500 bridges with prestressed members.

By the end of the decade, prestressed construction had spread to all regions of the country and was specified on such notable projects as the bridge-tunnel crossing at Hampton Roads, Virginia; the second Tampa Bay crossing; and the 24-mile bridge over Lake Pontchartrain, Louisiana.

Technical innovations have stimulated demand for new prestressed products. In the building field, prestressed design produced the folded-plate roof covering spans longer than 100 feet.

The structural advantages of prestressed concrete have also opened up a market in multistory buildings. A notable example is the Norton Building in Seattle. Constructed with 70-foot prestressed beam spans, this 21-story building has 200,000 square feet of column-free office space. A planned 35-story building in Los Angeles will combine steel columns with prestressed floors.

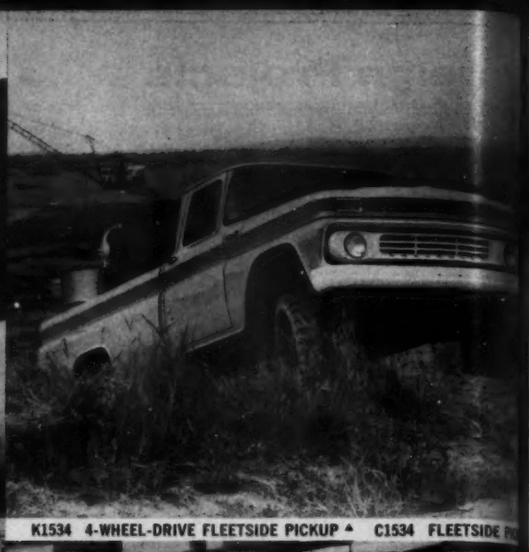
* *Buildings Materials Division, Business and Defense Services Administration, U. S. Department of Commerce.*

Foreign Projects

In Kenya, soil-cement is used by Raymond International, Inc., New York City, and a British firm to rehabilitate 250 miles of rural roads. Above, equipment works near Nairobi. Below, a Pettibone-Wood mixer on the first day's run.

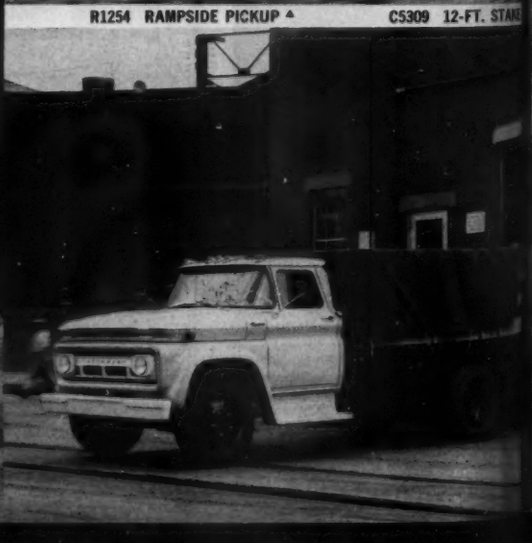
In London, a 500-foot microwave aerial tower and telephone exchange, with a revolving restaurant and observation galleries at its top, will soon be on the rise. Having a diameter of about 54 feet, the metal-framed-glass tower is to be constructed around a hollow shaft of reinforced concrete.

C1504 STEPSIDE PICKUP ▲ M8503 TANDEM WITH 10-YARD BODY ▼



K1534 4-WHEEL-DRIVE FLEETSIDE PICKUP ▲ C1534 FLEETSIDE PI

R1254 RAMPSIDE PICKUP ▲ C5309 12-FT. STAK



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1962

OCTOBER, 19

FROM CHEVROLET'S NEW WORLD OF WORTH!

JOB-MATCHED CHEVROLET TRUCKS FOR '62

MORE EARNING POWER THAN EVER BEFORE!

Here comes versatility on wheels—it's Chevrolet's 1962 truck fleet with new models, new power, new stamina . . . and new duty-tailored working ability to tackle a wider-than-ever range of hauling jobs. With this broad new lineup of tough-job specialists to choose from, it's easier than ever to get traditional Chevrolet thrift and dependability going for you. There are new power options in every weight class, including two brand-new plus-displacement V8's for medium- and heavy-duty models, so you can power up to pay off in the most brutal kind of duty. There are trim new look-ahead lines that spell safer seeing down the road in all conventional and Low Cab Forward models. The Chevrolet lineup includes money-saving conventional models in every weight class, a full range of space-saving medium- and heavy-duty LCF models, and, for top payloading efficiency, a wide selection of extra-compact tilt cabs in Series 60 and up. In addition, there's a new broader Step-Van fleet, four-wheel-drive models by the dozen, pickups, panels, platforms, stakes, bus chassis and the sensational Corvair 95's. Also new for '62 are history-making medium-duty Diesel models, a better-than-ever answer for hard-pressed haulers who really roll up the ton-miles. And there's new chassis durability for models in every weight class, with a big list of new standard and optional features offering extra built-in toughness and stamina. It's truer than ever for '62—no matter how mean the job, there's a Chevy truck built to do it better for less! Why not see your nearby Chevrolet dealer for details on the model made for you, and start finding out right away how much better business can be. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

NEW HEAVY-DUTY SIX AVAILABILITY—For 1962, the High Torque 261 Six is available as an extra-duty option* for all light-duty conventional and four-wheel-drive models and for medium-duty Series 50's, in addition to the optional* High Torque 283 V8. A heavy-duty design throughout, it offers a big margin of tough-job stamina, plus the extra payload punch of 150 horsepower and 235 lb.-ft. of torque.

NEW PLUS-DISPLACEMENT POWER FOR 60 AND 60-H MODELS—Now you can put premium punch behind your medium- and heavy-duty operations with Chevrolet's big new super-efficient High Torque 327 V8, optional* for all Series 60 and 60-H models. It's 327 cubic inches of tightly designed, hard-working muscle, developing 185 horsepower and 305 lb.-ft. of torque, for bonus performance sure to pay off no matter how tough the going gets.

NEW MEDIUM-DUTY DIESELS—Chevrolet's making medium-duty history in 1962, with a broad lineup of GM-Diesel-powered trucks in the 15,000- to 23,000-lb. GVW range. With the proved economy and payload performance of GM's advanced 4-53 Diesel engine, teamed with the tough years-ahead Chevrolet chassis that's virtually revolutionized big-truck operation, you've got a combination slated to show you savings like you've never seen before. If your job is the kind that puts maximum demands on your equipment much of the time, you owe it to yourself to find out just how much lower your costs can be.

NEW HIGH TORQUE 409 V8—Here's the new dimension in premium payload performance—409 cubic inches, tight-packed with what it takes to keep king-sized loads on the move. It's available as an extra-cost option for premium punch in all Series 80 models, including tandems, with a mountain-moving 252 horsepower and 390 lb.-ft. of torque. And backing up this brand of performance is a build that just can't quit—loaded with the best in premium-quality, top-durability design features. When you put this one to work, your tough jobs are tamed for good!

NEW CHASSIS RUGGEDNESS—Numerous refinements throughout the light-duty lineup, in wheels, wheel bearings, brake drums, springs, axles and frames, offer an extra margin of chassis stamina to stand up in the most demanding duty. In the big-tonnage field, ladder-type frames with extra shock-cushioning resilience are now standard on all medium- and heavy-duty models. Also, for Series 60 and 60-H models, there's a new Chevrolet-built 17,000-lb. rear axle* available in single- and two-speed versions. And, for extra-severe duty, new chassis equipment options* are available, including an Off-Road package for certain Series 60 models, and 9,000- or 11,000-lb. I-beam front suspensions for Series 80's (except tilt cab models).

NEW EASY-VIEW STYLING—New vision-sloped hoods for all 1962 conventional and LCF models let you see the road as much as 10½ feet closer ahead, and are better looking, too. Adding further to the new look are new grilles, exterior trim details and sparkling new colors. Inside, too, things are looking better for the man at the wheel, with new easy-to-live-with colors and tough good-looking upholstery.

JOB-TESTED CORVAIR 95's—They've got a year of enthusiastic acceptance behind them and they're still the talk of light-duty trucking! Chevrolet's sensational Corvair 95 models, including the unique Rampside pickup and the spacious Corvan, have set new standards for space and weight utilization in the half-ton field. With a roomy driver compartment up forward and the compact, perky 145 Six tucked under the load floor at the rear, the space between goes to work in a way conventional designs can't match. And, to top it off, this new way to work comes in as pretty a package as ever came down the pike!

**At extra cost.*

CHEVROLET SERIES D60 & D60-H DIESEL SPECIFICATIONS

Model, Wheelbase, Cab-to-Axle lengths	Series D60 Model	WB	CA	Series D60-H Model	WB	CA
	D6103	133"	60"	D6103-H	133"	60"
	D6203	145"	72"	D6203-H	145"	72"
	D6303	157"	84"	D6303-H	157"	84"
	D6503	175"	102"	D6503-H	175"	102"
	D6803	197"	124"	D6803-H	197"	124"
Gross Weight Ratings...GVW	15,000 to 19,500 lb.			23,000 lb.		
GCW	32,000 lb.			42,000 lb.		
Axle, Front.....Type	Independent Suspension					
Rating	5,000 lb.			7,000 lb.*		
Axle, Rear.....Make & Model	Chevrolet			Eaton 16800*		
Rating	15,000 lb.			17,000 lb.		
Type	Single- or 2-Speed*			2-Speed		
Brakes, Service.....Standard	Vacuum-Hydraulic					
Optional	Air-Hydraulic*					
Engine.....Make, Type	GM 2-cycle Diesel					
Model	4-53					
Gross Horsepower	130 @ 2800 rpm					
Gross Torque	271 lb.-ft. @ 1500 rpm					
Clutch Dia., Facing Area	13", 178 sq. in.					
Generator.....Type	AC Delcotron					
Volts, Amps	12V, 52A					
Tires.....Base Size	8-22.5/8PR Tubeless or 7.50-20/8PR Tube*					
Maximum Size	10-22.5/10PR Tubeless or 9.00-20/10PR Tube*					
Transmission.....Make, Type	Clark 264VO, 5-Speed			Clark 267V, 5-Speed		
Wheels.....Base	Chevrolet Disc			Cast*		
Optional	Budd 6-stud Disc* or Cast*			Budd 10-stud Disc*		

*Extra-cost equipment.

YOURS FOR THE ASKING . . . FREE INFORMATION

Use this convenient ordering coupon to get descriptive literature and specifications on new 1962 Chevrolet trucks to match your job. Just check what you would like, fill in your business address and mail to Chevrolet Motor Division, P.O. Box 7271, Detroit 2, Michigan.

Please Send:

1. Full-Line Brochure..... ☐
2. Corvair 95 Models..... ☐
3. Pickups & Light-Duty..... ☐
4. Panels & Delivery Models..... ☐
5. Suburban Carryalls..... ☐
6. 4-Wheel-Drive Models..... ☐
7. Medium- & Heavy-Duty Models..... ☐
8. Diesel-Powered Models..... ☐
9. Tandem Axle Models..... ☐

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1962 CHEVROLET JOBMASTER TRUCKS

CHEVROLET

For more facts, use coupon or Request Card and circle No. 261

Names in the News

PCA research counselor given honorary degree

T. C. Powers, research counselor of the Portland Cement Association, Chicago, has received an honorary Doctor of Science degree from the University of Toledo, Toledo, Ohio, for "unique contributions to research in civil engineering" and "unusual service to humanity."

Powers, who joined the association in 1930, was specifically cited for his furtherance of colloidal-physical theories and experiments and for his advancement of concrete and silicate science.

A. F. Faul, director of engineering, Iowa State Highway Commission.

Iowa announces three Highway promotions

A. F. Faul has been appointed director of engineering by the Iowa State Highway Commission to head its newly formed Division of Engineering. Faul has been with the commission for 41 years and most recently served as materials engineer in charge of the Materials and Testing Department.

Thomas E. McElherne has replaced Fauls as materials engineer. He is a veteran of 12 years' service in highway engineering for the commission.

Clarence E. DeYoung was promoted to assistant materials engineer, replacing McElherne. He was previously portland-cement engineer.

Corps reassigns

Several officers of the U. S. Army Corps of Engineers have been reassigned.

Maj. Gen. S. R. Hanmer, deputy chief of engineers for military operations, will be commanding general, U. S. Army Engineer Center and Fort Belvoir, Va.

Brig. Gen. Alden K. Sibley, deputy chief of logistics, military assistance advisory group, Vietnam, will be deputy chief of engineers for military operations, Washington, D. C.

Brig. Gen. Robert G. MacDonnell, division engineer, South Pacific division, San Francisco, has been named director of military supply, office of the chief of engineers, Washington, D. C.

Brig. Gen. W. C. Hall, director of personnel, office of the chief of engineers, will be director of research and development. He is succeeded as director of personnel by Col. R. S. Kelley.

Col. H. A. Frye, Jr., deputy director of military construction, office of the chief of engineers, is to be division engineer of the South Pacific division.

Col. George H. Walker, engineer, U. S. Continental Army Command, Fort Monroe, Va., has been named assistant commandant at the U. S. Army Engineer School in Fort Belvoir.

New district engineer of the Little Rock (Ark.) District is Col. John C. Dalrymple. He succeeds Col. A. J. Jacoby, transferred to France.

Allen W. Sanders, Jr., assistant for operations to the commanding officer of the Corps of Engineers Ballistic Missile Construction Office in Los Angeles, has been promoted to full colonel in the U. S. Army.

The new director of the Engineer Waterways Experiment Station at Vicksburg, Miss., is Col. Alex G. Sutton, Jr. He succeeds Col. Edmund H. Lang who has been assigned to Korea.

Cunningham-Limp names

G. Bretnell Williams has been elected to the board of directors of Cunningham-Limp, Detroit designing engineering, and building firm. Williams, formerly an industrial engineering executive for Chrysler, joined the company in 1957, and was appointed to the position of vice president last year.

Michigan county names Davey to new post

The Wayne County (Mich.) Road Commission has appointed James H. Davey managing director and airport manager, the commission's newly created top administrative post. He succeeds Joseph W. Gross, who retired recently as county highway engineer. Davey has been in charge of the county's $20 million airport expansion program. He joined the commission in 1949 and has held several legal and administrative positions with

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Manufacturer Memos

Philip S. Hill, president, and Harvey N. Black, senior vice president, of Hyster.

Philip S. Hill has been named president of **Hyster Co.**, Portland, Ore. He succeeds **Ernest G. Swigert**, who is now chairman of the board of directors and chief executive officer of the company. The board also appointed **Harvey N. Black** senior vice president; he will continue as secretary and treasurer.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has created a cement-industry department to handle the sale of all its products and services to the domestic cement and lime industries. **Frank E. Briber, Jr.**, is manager of the new department, which combines both marketing and engineering functions.

Wray A. Shockley has been appointed manager of the pyro-processing machinery section; and **L. S. Hollingsworth**, sales manager of the renewal-parts section.

L. J. Frick has been named to the new position of manager, Industrial Equipment Division sales, Midwest region, with headquarters in St. Louis. **J. C. Treible** succeeds him as manager, general industrial sales, St. Louis district.

Clinton R. Carlisle is now manager of the Hartford, Conn., district of the Industries Group.

Dane T. Scag has been appointed assistant director of research.

T. D. Lyons, formerly comptroller of **Allis-Chalmers**, has been named to the new position of vice president, administration, Industries Group. **W. S. Pierson** succeeds him as comptroller, and **E. A. Spika** becomes assistant comptroller.

C. C. Dybvig has been appointed to the newly created position of vice president of marketing for the **Dana Corp.** of Toledo, Ohio. He joined the firm in 1954 as general sales manager and in 1958 was elected vice president of sales.

GMC Truck & Coach Division, Pontiac, Mich., has made **John A. Castle** director of public relations. Castle replaces **Bernard W. Crandell**, now director of public relations for the Defense Systems Division of General Motors.

Malsbary Mfg. Co., Oakland, Calif., has promoted **Michael K. Dugener** to vice president of sales. He had been general sales manager since 1950. The company, which makes steam cleaners, steam generators, and industrial water heaters, recently completed a new plant in Uniontown, Pa.

Robert L. Wicker has been named manager of distributor sales of **American Hoist & Derrick Co.**, St. Paul, Minn. He was formerly general sales manager for Bros, Inc., of Minneapolis, a manufacturer of road-building machinery.

Eugene F. Stratford has joined **Alpha Portland Cement Co.**, Easton, Pa., as New York district sales manager. He was formerly marketing manager for the Barrett Division of Allied Chemicals Corp.

CIRCULAR LOOPS AT STREET ENDS, once a big snow-removal problem in Tonawanda, N. Y., are cleared by this Lorain Moto-Loader Model ML-157, equipped with a Sicard Model BM Snow-Blower.

What's ahead for prestressed concrete

This expert feels we are just at the beginning

When C&E's editors decided that this issue's prestressed-concrete section wouldn't be complete without the remarks of a foremost authority on the subject, they ran into a snag; T. Y. Lin, the logical man, was on a lecture tour of Australia and New Zealand. Western field editor Ralph Monson rose to the occasion, however, and despite an ocean's distance between him and his assignment, got this exclusive interview with a man who is in the vanguard of prestressed-concrete engineering and design.

Q. Prof. Lin, you spoke on the future for prestressed concrete four years ago at the World Conference on Prestressed Concrete in San Francisco. Do the unusual design concepts you presented at that time seem closer to reality today?

A. My predictions certainly seem to be substantiated. The extensive development in prestressed-concrete slabs throughout the United States, such as those used in the United Air Lines office building in Chicago, and such internationally outstanding structures as the exposition shell in Paris with a 720-foot span all point to the unlimited possibilities in prestressed concrete. Now under construction is a 1,000-foot arch in Sydney, Australia, with the arch proper, the columns, and the girders all prestressed. There are also many unique shells of long span, as well as tall buildings, going up. But in spite of all these structures, I still feel that we are only at the beginning.

Q. What do you expect will be the outstanding development in prestressing in the next few years?

A. We now have 1 per cent of our buildings constructed in prestressed concrete. This will soon grow to perhaps 10 per cent or more, and will provide an enormous volume of prestressed-concrete construction.

Q. Specifically, what new things do you look for in building construction?

A. The immediate new things in building construction will be tall buildings to resist earthquakes. Our firm is consulting on several such buildings in San Francisco, Montreal, Los Angeles, Honolulu, and other cities. There are many new things to come in industrial, commercial, and apartment buildings. However, little progress as far as prestressed-concrete construction is concerned will be made in small buildings and dwellings. An exception to this may well be the mass production of small apartment buildings when these can be standardized. Prestressed concrete offers great possibilities for standardized precast construction which, of course, can well be used for small buildings.

Q. What are some of the problems of specification, acceptance, etc., in building construction, and how can they be overcome?

A. The main problem in building construction is the gaining of knowledge on the part of architects and engineers who, at the present time, still do not fully realize the possibilities and implications of prestressed design and construction. However, this is coming along fast. There will be

One of the world's outstanding authorities on prestressed concrete, T. Y. Lin is president of T. Y. Lin & Associates, consulting engineers specializing in prestressed-concrete design, with offices in San Francisco, Los Angeles, Chicago, and Dallas. He is a professor of civil engineering at the University of California, chairman of the university's Division of Structural Engineering and Structural Mechanics, and director of the university's Structural Engineering Laboratory.

Mr. Lin is vice president of the International Federation for Prestressing, and a former director of the Prestressed Concrete Institute. He served as general chairman of the World Conference on Prestressed Concrete held in 1957 in San Francisco, and headed an American delegation to inspect concrete engineering in Russia in 1958.

A graduate of Chiaotung University, China, and the University of California, Mr. Lin is the author of several books and many technical papers on prestressed concrete, moment distribution, and bridge design.

problem of owners accepting new materials, once architects and engineers recommend them. Efforts of the professional organizations will help, too. The American Concrete Institute and the Prestressed Concrete Institute have now agreed on identical codes, and the Uniform Building Code has incorporated prestressed concrete in its 1961 edition.

Q. What about the future of prestressing in bridges?

A. The application of prestressed concrete in bridges has progressed much faster in countries outside of the United States, even though the use of prestressed concrete has shown great economy in bridges in the U. S. In Maracaibo, Venezuela, a prestressed-concrete bridge was built with 771-foot spans; 400-foot truss bridges are being built in India; 500-

(*Continued on next page, col. 4*)

THIS 43-TON telescoping tower crane, at work on an $18 million water filtration plant job in Detroit, is the second Mayco-Weitz tower crane to be imported from France. Barton-Malow Co., Detroit contractor, needed a crane that could travel the narrow galleries of the Allen Park filtration plant and reach adjacent areas. The crane, which is 7 feet 8 inches square, has a telescoping erection Screw that permits boom working heights from 55 to 328 feet. The boom slews around 360 degrees. Tubular Structures Corp. of America, Los Angeles, is American distributor of the crane.

(*Continued from preceding page*)

foot cantilever spans in England; 1,000-foot arch spans in Australia. Undoubtedly, bridge designers in the United States will soon find themselves following the same pattern, both for economy and utility.

Q. Do you envision any bridges for intercontinental travel?

A. As the earth becomes more densely populated and as people realize the absurdity of total war, we will learn to live together and will undoubtedly travel more extensively. Then intercontinental bridges will be built, and prestressed concrete will surely be one of the materials used.

Q. Are we likely to see prestressed highways and airport pavements in the near future?

A. Prestressed highways and airport pavements at the present time seem to be economical only if prestressed chemically. Prestressing of airport pavements affords tremendous advantages. However, the economy at the present time does not allow its extensive use.

Q. What can we look for in marine construction?

A. Marine construction has been and can be built safely and economically in prestressed concrete. Original thinking is necessary on the part of our engineers. Great advancement has been made in the field of prestressed-concrete piling, and a number of sea walls have been built. Undoubtedly more piles, sea walls, wharfs, and similar structures will be built of prestressed concrete, particularly since the utility of this construction in highly corrosive media has proven to be very good.

Q. What do you envision in the use of prestressed concrete in other structures, such as dams, masts, crossties, pipes, etc?

A. Prestressed concrete will be applied in all of these, but masts and ties will be economical only when the saving in maintenance cost is taken into consideration. Pressure pipes have been made of prestressed concrete, and there will be more of them made as techniques of casting and prestressing improve. Dams will be prestressed in certain cases, that is, when tension is the governing factor. However, prestressing will probably be used in dams to make concrete dams economically competitive with earth-fill dams.

Q. Are new developments likely in the use of other methods of prestressing concrete, such as fiberglass tendons, external prestress, the use of aluminum, or self-stressing concrete?

A. Fiberglass tendons are developing slowly, as is external prestress—which has already been used for special cases. There has not been, nor is there planned, any development of aluminum for prestressing. However, self-stressing concrete is developing extremely rapidly and will be used commercially in the near future.

Q. What improvements do you foresee in lightweight aggregates?

A. Application of lightweight aggregates to prestressed concrete reduces the amount of steel required and as such enhances its economy. In

certain parts of the United States, lightweight concrete is almost as economical as hard-rock concrete, so that it can be used universally for prestressing. England is doing research in the application of lightweight concrete for prestressing. This points to the possibility of lightweight concrete being used extensively in the near future for greater economy.

Q. What do you think lies in the future for the prestressed-concrete manufacturing industry insofar as automation is concerned?

A. The manufacturing industry for prestressed concrete will certainly want to reach a larger degree of automation. Automation is quite advanced in Russia today, but our industry will catch up and surpass Russia in due time.

Q. Do you think the Soviet Union will surpass us in prestressed-concrete applications?

A. The Soviet Union is now ahead in mass production, but our industry will surpass it in the near future. In aesthetic and architectural applications we are ahead now and will probably remain so.

Q. Does prestressed concrete have a future in the underdeveloped countries?

A. Very, very much so. This is primarily so because structural steel in many underdeveloped countries is scarce, whereas cement and aggregates are easily available. High-strength steel can be shipped with much less difficulty than structural steel. Since prestressed concrete offers greater savings in materials, it follows that it will be used to a greater extent in the development of underdeveloped countries.

Q. What are your observations on the use and acceptance of prestressed concrete in other countries as a result of your current lecture tour?

A. Prestressed concrete is developing in other countries, even though many are behind the United States now. Germany, of course, is and has been using prestressed concrete extensively, as are many of the other European countries. This type of construction is developing fast in Australia, where there are a number of bold and unique applications of prestressed concrete to long spans.

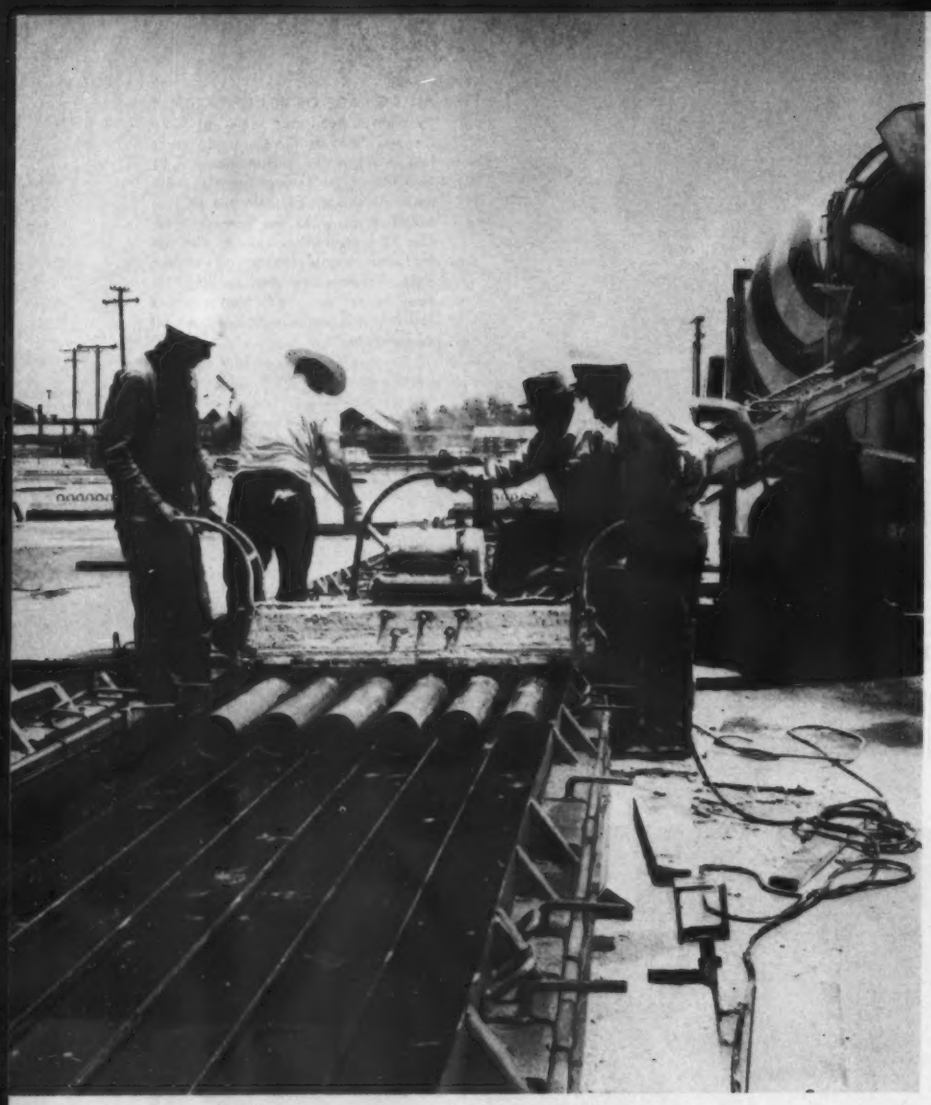
Q. What accomplishments are probable in the basic research on prestressed concrete?

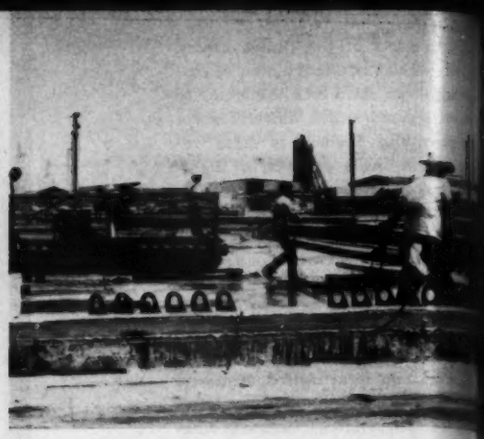
A. The accomplishments in the basic research will be improvements in material properties and basic theories in the behavior of prestressed concrete.

Q. What will our universities and engineering colleges do in the near future to better prepare our young engineers to cope with revolutionary thinking and new methods?

A. We are already doing this in our top universities by teaching them basic principles rather than rules of thumb and codes of practice. This will catch on in other colleges, giving tomorrow's engineer a solid basis from which to operate, rather than a rigid code of practice. THE END

AN AVERAGE OF 40,000 YARDS of concrete placed per week at Glen Canyon Dam on the Colorado River has brought the blocks about 212 feet above the lowest point in bedrock. At this stage, about a million yards of concrete has been placed. The 15-foot-diameter pen stocks can be seen being embedded in the dam. When completed to its 710-foot height in 1964, the structure will contain some 4,865,000 yards of concrete.





With pretensioned Roebling strands and aluminum tubes in place for prestressed cored slabs at Arizona Sand & Rock Co.'s plant in Phoenix, concrete is chuted to forms from a Challenge mixer on a White truck. A Wyco 1¼-inch high-speed electric vibrator gets the mix down around the tubes; a Stow vibrating screed strikes off the concrete.

Aluminum tubes make voids in prestressed cored slabs

Ten new beds in precasting plant produce hollow slabs on daily casting schedule

Prestressed cored slabs have become a standard production item for many prestressed-concrete-products plants, but the methods of manufacturing them vary considerably. The Arizona Sand & Rock Co., Phoenix, has developed an interesting technique for forming the voids, using special aluminum tubes as mandrels.

The tubes, especially extruded by the Reynolds Metals Co., are a heavy wall section with an outside diameter of 5⅝ inches. Fitted with a heavy pulling cap on one end, the tubes are pulled out of the concrete by a winch after the concrete has begun to set up.

Typical casting operation

Retooling this operation last spring, Arizona Sand & Rock Co. built ten new casting beds especially for the production of the cored slabs. Each bed is 90 feet long and can produce the slabs in any dimension up to 36 feet in length.

Each bed is fitted with a set of steel forms manufactured by the Valley Mfg. Co., Valley, Nebr. The beds are equipped with tie-down devices so that the pretensioned strands can be harped up or down at any desired point to provide for reversal of stress in cantilever or continuous members.

In a typical operation, the beds produce slabs 4 feet wide and 8 inches thick in varying lengths. As long as the slab length is less than half the length of the bed, two or more slabs can be cast on each bed.

The seven Roebling ½-inch prestressing strands are threaded the length of the bed and pulled to the desired tension by hydraulic jacks. The six aluminum tubes are set into the bulkheads after being carefully cleaned and sprayed with a deadener or retarder that kills the set of the cement around the tubes.

Transit mixers deliver the concrete from the company's ready-mix plant across the street. The 8-sack, high-early-strength mix contains a Pozzolith admixture. The transit mixers discharge directly into the forms, and two workmen strike off the concrete with a Stow vibrating screed. Another man with a Wyco 1¼-inch high-speed electric vibrator works the mix down around the tubes and the prestressing strands. The surface is finished with wood floats.

Withdraws tubes

Since this is a hot, dry country where the sun shines practically every day, it is important that the slabs be kept from drying out. A workman sprays the surface with a fog spray during the initial curing period before the tubes are withdrawn and until a spray of curing compound is applied.

The tubes are pulled out about two

As soon as a tube is pulled clear, two workmen carry it to one side to be cleaned by another crew member. The deadman in the foreground has a series of rings for the snatch block for the pulling cable. Each ring is directly in line with one of the tubes. The snatch block is moved from one to another as tubes are pulled out.

Cleaned tubes are sprayed with a deadening or retarding agent that keeps the concrete from adhering to the tubes. The man at far left sprays one of the slabs with water to keep the surface moist. The slab between the workmen has been covered with a tarp.

When concrete has hardened enough, tubes are pulled out by a winch. Each tube has a pulling loop attached at one end, and the hook on the cable from the winch is attached to this loop. The workman supports the free end with a hook.

This electric-powered winch, a converted mine-shaft hoist, pulls out the aluminum tubes after concrete has hardened sufficiently. In the background, the crew member with the hat walks beside the lead end of the tube being pulled.

to three hours after the concrete has been placed—depending on the weather. To do this, a workman attaches the hook on a cable to the pulling ring on the end of a tube. The cable runs through a snatch block, which is attached to a hook on a deadman that is exactly in line with the tube.

An electric-powered winch applies tension to the cable, pulling until the tube begins to move. Once started, it slides out easily without any damage to the concrete. As the six tubes are pulled successively, the snatch block is moved from one hook to another to keep it always lined up with the tube being pulled.

When the six tubes have been pulled, the surface of the slab is given a broom finish and sealed with a light spray coat of Thompson's Water Seal. The slab is then covered with a vinyl-treated nylon cover for the 16 to 20-hour curing period.

On the following day, the slabs are picked out of the forms by a self-propelled crane using a heavy strongback and a 4-point pickup. The crane places the slabs in stockpile to await shipment to the job.

The manufacturing operation is under the direct supervision of plant superintendent Jack Neal. The prestressing operations of Arizona Sand & Rock Co. are supervised by vice president Henry V. Berry. THE END

No. 2 in a series of announcements on new HOUGH machines

This all-new 1¾ cu. yd. PAYLOADER

is far ahead

of any machine in its price class . . . in capacity, power, design and performance

The Frank G. Hough Co. has been engaged in a continuous program of constant research, development and improvement of existing models ever since it pioneered the first four-wheel-drive tractor-shovel. This program led to the new concept and design of the H-30 and H-120 PAYLOADER units which gained tremendous acceptance during the past two years and has helped to maintain PAYLOADER leadership in the industry.

The H-60 represents even further progress and development. It is a completely new machine in size and capacity with these special points of interest . . .

High Lift and Long Reach: Note the ease with which the operator deposits a full load in the hopper. Faster, more productive cycles are the result.

Safety and Convenience: All bucket and boom mechanisms are located ahead of the operator compartment for maximum protection. The steeply-sloped cowl and open design give 100% visibility. The comfortable, adjustable bucket seat and conveniently located controls make operation easy. The walk-in operator's compartment is easily accessible with safety ladder and hand rails.

Less Maintenance: Only PAYLOADER units like the new H-60 have a simplified boom mechanism with a single bucket tilt cylinder. This means you have from 4 to 10 fewer pivot and grease points and fewer parts to service and maintain. Furthermore, all pivot points on steering, boom and bucket mechanisms are fitted with "O" rings and other seals which keep grease in and dirt out to provide longer life and less maintenance. The hydraulic steering system uses two direct-acting rams with fewer pivot points.

"Keep-clean" Hydraulic System: A valuable, exclusive HOUGH feature is the closed and pressure-controlled hydraulic system to keep out air-borne dust and moisture. The new cylindrical, vessel-type reservoir has extra strength and the entire top is easily removed for thorough maintenance and easy servicing. There is a complete full-flow micronic filtering system.

"No-stop" Full Power-shift Transmission: This HOUGH transmission was developed exclusively for rubber-tired tractor-shovel requirements and has been thoroughly proven on thousands of PAYLOADER units. All shifts, up or down, forward or reverse, can be made "on-the-go" with no stopping and engagement of gears needed for "range-shifts."

Sealed, 4-wheel Power Brakes: These powerful brakes are air-controlled with only touch-toe effort and are sealed against dust and dirt. Furthermore, the exclusive HOUGH axle design makes it possible to service and re-line the brakes without removing and exposing planetary hubs to dust and dirt. Another important HOUGH-pioneered feature is the "Operator's choice" dual brake pedals that enable the driver to brake with or without transmission engaged.

Positive Oil Cooling: Separate fan-cooled oil-to-air radiator assures positive cooling of both transmission and torque-converter oil. Another exclusive HOUGH protective feature.

"Power-transfer" Differentials: Both axles are equipped with torque-porportioning differentials. When one wheel has better traction than the other on the same axle, it can automatically receive up to 38% more torque. This assures the best possible traction at all times.

The new H-60 model is offered with a choice of gasoline or diesel power and with buckets from 1⅛ to 3½ cubic yard capacities. (S.A.E. rated) For additional information and specifications, see your HOUGH Distributor or use the attached coupon.

THE FRANK G. HOUGH CO.
762 Sunnyside Ave., Libertyville, Ill.
Send full data on all-new Model H-60 "PAYLOADER"

Name _____

Title _____

Company _____

Street _____

City _____ State _____

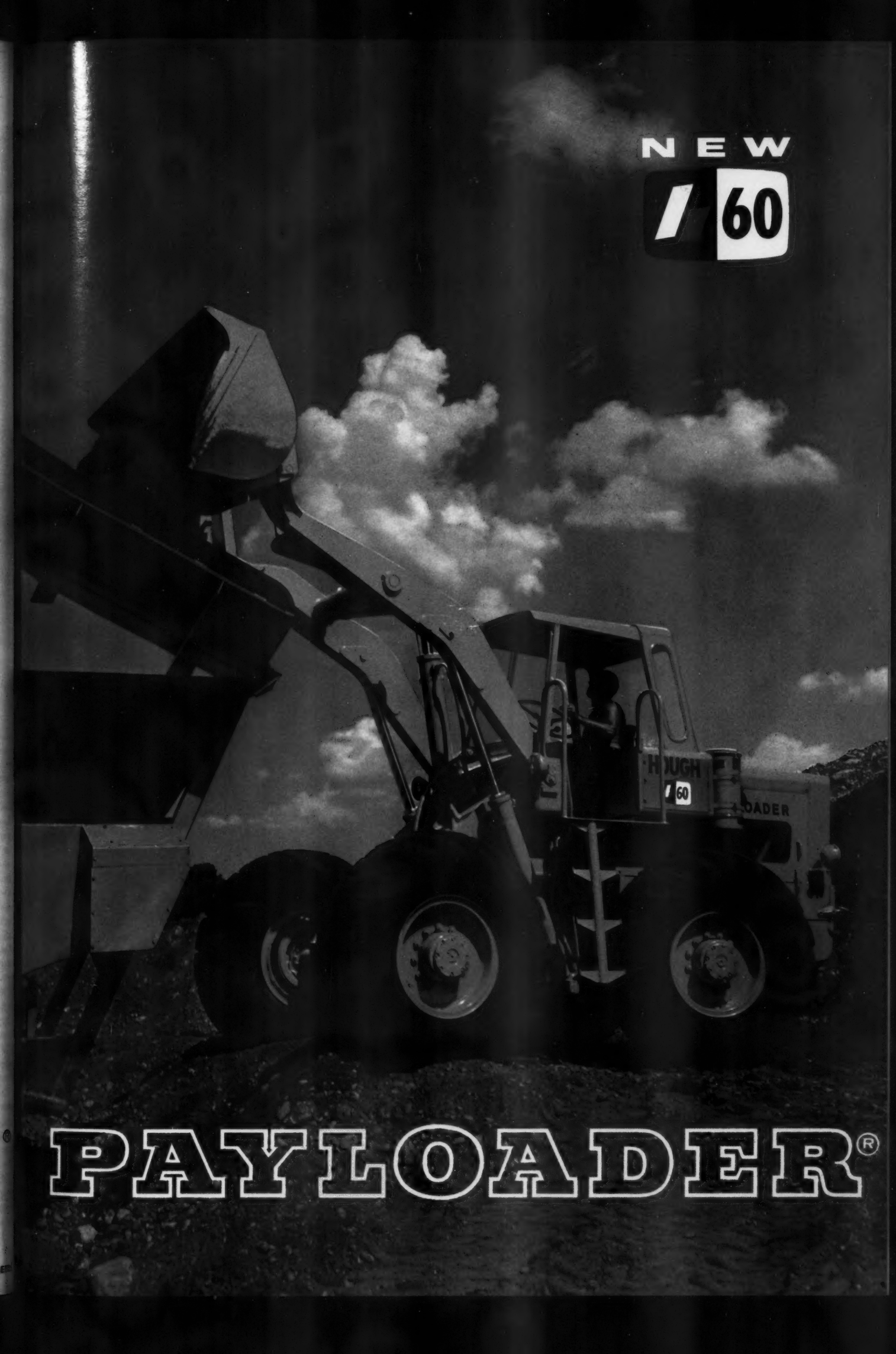
10-8-1

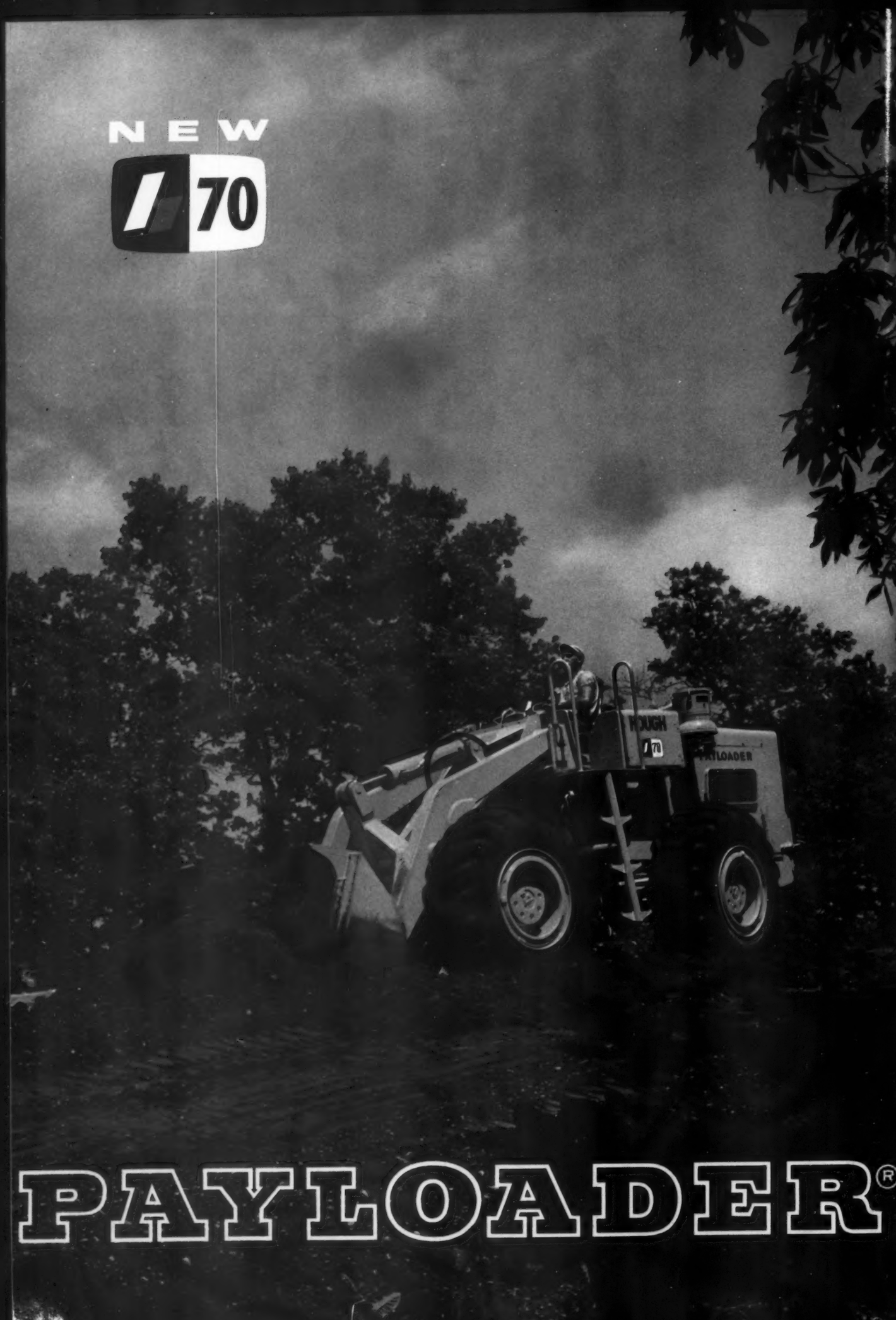
THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY - INTERNATIONAL HARVESTER COMPANY

HOUGH, PAYLOADER, PAYDOZER, PAYMOVER, PAYLOGGER, PAYLOMATIC and PAY are registered trademark names of The Frank G. Hough Co.

HOUGH®

For more facts, use coupon or Request Card and circle No. 271


NEW
60
PAYLOADER®


NEW
70
PAYLOADER®

No. 3 in a series of announcements on new HOUGH machines

The new 2½ cu. yd. PAYLOADER

has everything

according to the aggregate producers and contractors who tested this unit

The advanced design and exclusive features of this new H-70 series "C" model were subjected to many months of continuous, rugged testing by users on actual job-site locations before final evaluation.

Those items which contributed the most to the unmatched performance of the smaller H-30 and larger H-120 four-wheel-drive PAYLOADER models during the past two years served as a guide for the development of this completely new 2½ cubic yard tractor-shovel.

By comparison with the previous model, the H-70C has increased capacity, more power, greater flotation, additional reach, easier handling, simplified maintenance, new safety features and vastly superior performance. Some of the major points of interest are as follows:

More Capacity: An increase of 25% in the size of the standard bucket, from 2 to 2½ cubic yards. (S.A.E. rated) Optional buckets from 1⅜ to 5 cu. yds. are available.

More Power: The new heavy-duty diesel engine delivers 148 hp which is an increase of 20% over the previous model. This gives the H-70C more horsepower per pound of machine weight than any comparable machine.

Safety and Convenience: All bucket and boom mechanisms are located ahead of the operator compartment for maximum protection. The steeply-sloped cowl and open design give 100% visibility. A comfortable, adjustable bucket seat and conveniently located controls make operation easy. Safety ladder and hand rails provide easy access to the walk-in driver compartment.

Less Maintenance: The only loader in its class with simplified PAYLOADER boom mechanism and single bucket tilt cylinder. This means you have from 4 to 10 fewer pivot and grease points and fewer parts to service and maintain. In addition, all pivot points on steering, boom and bucket mechanisms are fitted with "O" rings and other seals which keep grease in and dirt out to provide longer life and less maintenance.

"Keep-clean" Hydraulic System: A valuable, exclusive HOUGH feature is the closed and pressure-controlled hydraulic system to keep out air-borne dust and moisture. The new cylindrical, vessel-type reservoir has extra strength and the entire top is easily removed for thorough maintenance and easy servicing. There is a complete full-flow micronic filtering system.

"No-stop" Full Power-shift Transmission: This HOUGH transmission was developed exclusively for rubber-tired tractor-shovel requirements and has been thoroughly proven on thousands of PAYLOADER units. All shifts, up or down, forward or reverse, can be made "on-the-go" with no stops for any "range-shift" engaging of gears.

The H-70 series "C" has many other proven HOUGH features including a separate fan-cooled, oil-to-air radiator for effective cooling of both torque-converter and transmission oil; torque-proportioning differentials for better traction; "operator's choice" dual brake pedals which permit braking with or without transmission engaged. For complete information on the tractor-shovel that "has everything" see your HOUGH distributor or use the coupon.

THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
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HOUGH®

THE FRANK G. HOUGH CO.
762 Sunnyside Ave., Libertyville, Ill.
Send complete data on H-70C PAYLOADER

Name _____
Title _____
Company _____
Street _____
City _____ State _____

10-B-2

For more facts, use coupon or Request Card and circle No. 272

Prestressing wires expos box

With the top slab cast for a box-girder bridge carrying a San Diego freeway, wires that will remain exposed inside girders are post-tensioned by hydraulic jacks. Above is a rig mounted on the rear of a pickup truck, and below, a rig that rolls on its own casters handles the job. The hydraulic jacks are by William S. Pine; hoists are Budgit. The prestressing is done by the BBRV system, which has a Swiss patent; Joseph T. Ryerson & Son, Inc., has the U. S. franchise for the process.

The prestressing wires are carried through the heavy solid end sections of the box girders by 5¾-inch steel tubing. Above is the first unit handled. Note how reinforcing is bent around the tubes, which were difficult to get in the right place and secured. On the second section, below-tubes are being held in place by wood templates.

The galvanized wires of the prestressing cables are left exposed inside the cellular deck structure of a 237-foot 2-span continuous post-tensioned box-girder bridge recently completed in San Diego, Calif.

The structure is one of 15 bridges included in a $5,219,000 contract awarded by the California Division of Highways to a joint venture of R. E. Hazard Construction Co., San Diego, and W. F. Maxwell Co., Fontana. The project completes a 1.27-mile section of 8-lane freeway bypassing the central business district of the city.

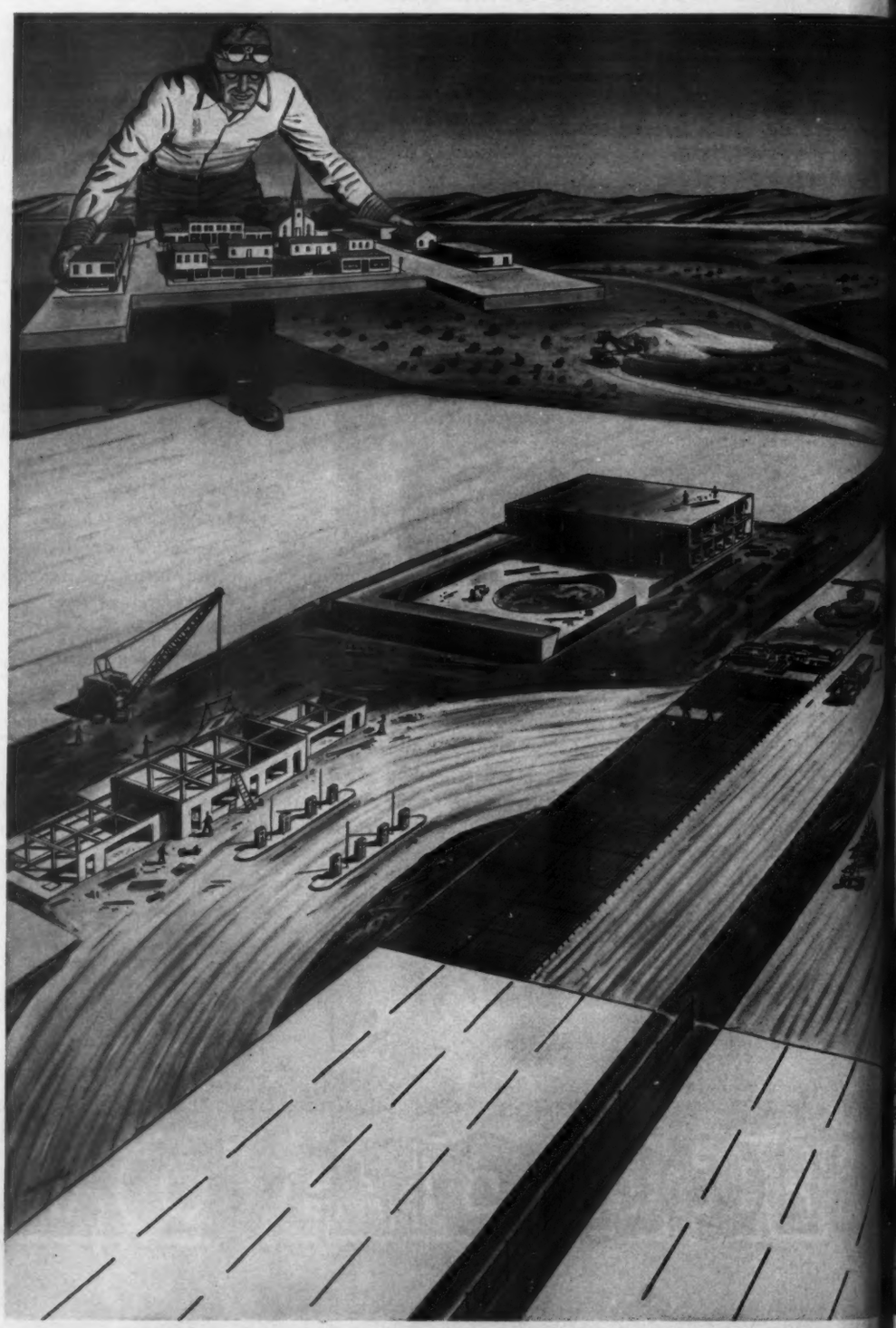
One of the structures having a prestressed box-girder deck is the First Avenue Overcrossing of the freeway. This bridge is 339 feet long from end to end, including 45 and 57-foot simple ends spans and closed-end abutments in addition to the prestressed main spans.

The deck has an over-all width of 73.33 feet, consisting of a 52-foot roadway and two 2.67-foot sidewalks carrying steel railings. The box girder is 6 feet deep with webs spaced at approximately 7-foot centers to form ten interior cells. The bottom slab is 5½ inches thick, and the top slab is 6⅜ inches including the concrete riding surface. Diaphragms are 1 inches thick, and girder webs tape from 10 inches at the center of span to heavy solid end sections.

Diaphragms carry wires

The prestressing system used th parallel-lay button-headed wire cables of the BBRV system (Swis patent), for which Joseph T. Ryerso & Son, Inc., has the U. S. franchis

The contractor formed and cas the lower slab, girder webs, and dia phragms in two pours, taking half o the bridge in each. Concrete-place



box-girder bridge

Cables bear on steel saddles in diaphragms of two-span continuous bridge deck

ment openings were formed in each diaphragm and at selected spots in the girder webs to provide access into all of the cells of the deck for future inspection.

The steel saddles that carry the prestressing wires were set in the forms and embedded in the diaphragms as the concrete was cast. These saddles and the holes through the diaphragms for the wires are located so that the cables form an approximate catenary. Since the bridge is on a skew, and the diaphragms do not all fall at the same point in the span, there is slight variation from the true curve.

Each saddle was designed for the specific position it occupies, being shaped for the exact angle of inclination of the cables going each way. These saddles were set to within a tolerance of ⅛ inch, both horizontal and vertical. Since the units weigh about 100 pounds each, it required accurate work to get them precisely positioned and well anchored in the forms.

Where the cables drape down toward the bottom of the girder, the saddles are at the top of the openings in the diaphragms, and the cables bear up against them. Where the cables are at the top of the section, the saddles are underneath.

Cables alongside girder webs

There are nine interior girder webs in the section, and each of these has three prestressing cables on each side of it. The two exterior girders have four cables each, and these are located on the inside.

The cables, supplied by Ryerson, consist of from 29 to 31 separate 0.25-inch high-tensile stress-relieved heavily galvanized wires produced by the Columbia-Geneva Division of U. S. Steel. The number of wires per cable depends on the load requirements in each case.

When the contractor had cast the lower slab, webs, and diaphragms, he installed the prestressing cables. Ryerson delivered the cables on spools, with the three or four cables for each position wound together on connecting spools. With the aid of a winch truck, the cables were threaded through the saddles and pulled into place in these groups.

Flexible tubes at ends

Sections of 5¾-inch galvanized steel flexible tubing were placed in the forms to carry the cables through the solid end sections of the deck. These large-diameter tubes also accommodate the anchor heads of the prestressing cables prior to tensioning. When the cables are tensioned, these anchor heads come out to the outer face of the concrete.

Close tolerances were required to get these tubes into place and properly located to fit the angle of the cables. Some of the conventional reinforcing steel had to be bent out around the tubes. A template was devised to hold the ends of the tubes in place at the inside of the bulkhead.

When the top slab had been cast

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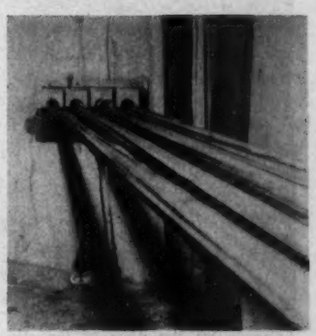


Post-tensioned cables follow an approximate catenary as they are carried on steel saddles through the diaphragms. This is an outside girder with four cables; interior girders have three cables on each side. All are stress-relieved high-tensile wires in parallel-lay cables.

After the bottom slab, webs, and diaphragms are cast in one continuous pour, the prestressing wires are pulled through. The 0.25-inch wires in groups of 29 to 31 are pulled through the openings in the diaphragm by a winch truck.

(*Continued from preceding page*)

and the concrete had attained the required 4,500-psi strength, the prestressing cables were tensioned by hydraulic jacks. In the BBRV system, a jack rod screws into the anchor head in which all of the wires of the cable are seated. At the beginning of the stressing operation, this anchor head is back inside the flexible tube.

A 200-ton jack was attached to each end of a cable, and the wires were pulled until they were stressed in excess of 70 per cent of their ultimate strength of 216,000 psi. The jacks were then slacked off to the 70 per cent point.

At this stress, the wires had elongated a total of about 16 inches, and the anchor heads had been pulled out of the recess. A large lock nut was then screwed over the outside of the anchor head. The lock nut bears against the anchor plate in the concrete and carries the load of the cables. When this operation was completed, the tubes behind the lock nuts were grouted full. The hydraulic jacks and pumps were by William S. Pine.

Since this was the first application of this type of parallel-lay wire-cable prestressing in a box girder, there were some preliminary problems to solve. One of these was the question of the bottom wires holding up in the saddles with resulting unequal stresses in the several areas. This resulted in a study by Ryerson of the coefficient of friction between galvanized wires and a greased cast-steel saddle.

Some of the questions were resolved by the use of a test device built and used in Ryerson's Los Angeles shops. These tests and actual measurements of stress and elongation of some of the cables in the structure gave assurance that the structure was acting in accordance with the design calculations.

By stressing the wires to somewhat in excess of 70 per cent of ultimate and then slacking off, the effects of friction over the saddles were minimized. The assumed final tension in the wires is 60 per cent of ultimate or 130,000 psi.

The heavily galvanized wires are exposed inside the cellular box girder throughout their entire length, except for the short grouted sections through the bulkheads at the end of the spans. Manholes in the bridge deck provide access into the girders so that all of the wires may be inspected at any time.

Building piers and abutments

The W. F. Maxwell Co., building all of the structures under the joint-venture arrangement, used some unusual techniques in building the substructures for the bridge.

At the north abutment, there was a 50-foot-deep cut with a bank that showed a tendency toward instability. To eliminate the danger to workmen at the base of this bank, Maxwell prefabricated the form and reinforcing for the spread footing of the leg counterfort abutment. The footing was fabricated in sections 35 to 40 feet long, which were set in place by a 25-ton Koehring truck crane. The exposure of workmen at the base of the high bank was held to an absolute minimum.

Forms for the 45-foot-high abutment were prefabricated in large sections and set by crane. The largest single section was the front face form, which measured 46 × 44 feet. Fabricated of double 4 × 6 wales, 4 × 6 studs, and ⅝-inch plywood sheathing, the huge form section, with scaffolds and hardware attached,

Columns for the piers of the structure are cast in sectional steel forms such as this one. The truck crane is bucketing concrete to the forms from transit mixers handling the delivery.

A 46 × 44-foot section of wood face forming for the north abutment, weighing about 15 tons with scaffolds and hardware attached, and made up of double 4 × 6 wales, 4 × 6 studs, and ⅝-inch plywood, is picked up by the Lorain 35-ton crane.

A Lorain 35-ton crane swings a ¾-yard bucket from a Challenge transit mixer on a Cook Bros. truck to the deck of one of the approach spans. Main spans of the structure, which are prestressed, have been completed.

As concrete is placed and vibrated for the top slab, finishers strike it off to grade with a hand screed. Crews working on the main spans used a power screed to strike off the concrete. The bridge is one of 15 being built.

weighed 15 tons. It was stripped in one piece and re-used intact.

The center pier consists of 4-foot-round columns on spread footings. These were formed with sectional metal forms.

The concrete for the pier and abutments as well as the deck was supplied by the San Diego Transit Mixed Co. and was placed by a Lorain 35-ton motor crane.

The forms for the box-girder deck system were supported on timber piling shores—some as high as 45 feet. The piles were set on mud sills and cross-braced with 2 × 6's. Caps of 12 × 12 timbers, 6 × 16 stringers, 2 × 6 joists, and ⅝-inch plywood decking completed the form for the lower deck slab.

The lower slab, webs and diaphragms were formed and cast monolithically in the conventional manner; the only unusual features were the placing of the steel saddles and the forming of the many access openings. The top slab was formed with 2 × 4 joists and plywood with leg supports from the lower slab.

Making use of the various access openings, the contractor stripped the entire false decking for the top slab, leaving the interior of the bridge clean and completely accessible.

The deck concrete was placed by crane and bucket from transit mixers and finished by Clary screeds.

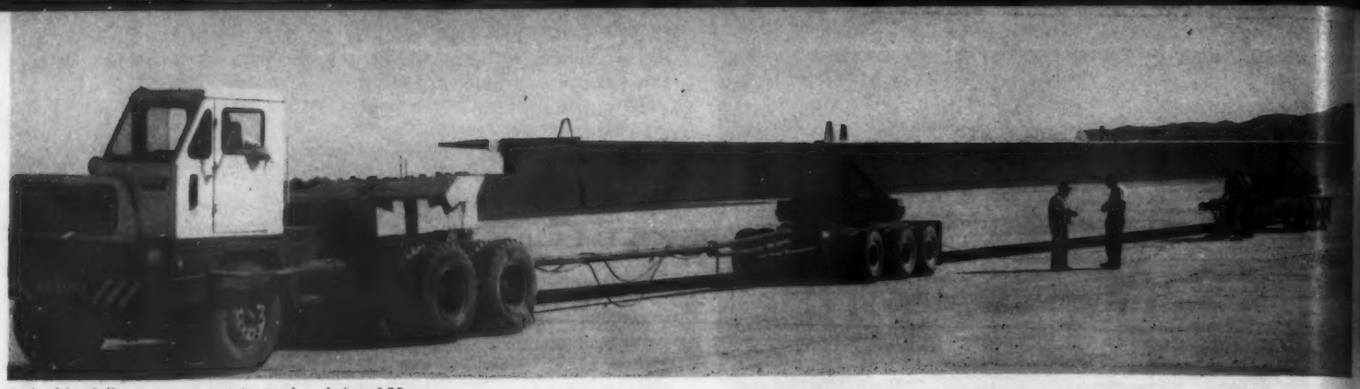
Personnel

Representing the California Division of Highways on the project are resident engineer Tom Drane, assistant resident engineer Roger Clark, bridge representative W. V. Cryderman, and assistant bridge representatives Troy Castleberry and Milton Wilson. The state highway engineer is J. C. Womack.

The general superintendent for the W. F. Maxwell Co. on the project is Truman Hart. On his staff are project engineer Bill Martin, carpenter superintendent Rupt Gault, ironworker superintendent Vince Faulk, prestressing superintendent Vic Franks, and office engineer Hoot Raun.

The project manager for the post-tensioning by Joseph T. Ryerson & Son, Inc., was W. F. "Bill" Tinlin.

THE END



A double dolly arrangement is used to bring 152-foot girders from the casting plant in Phoenix to the city's Sky Harbor Airport, where they will be used in the roof of the new terminal. A guide car in communication with the control tower leads the truck across the main runway.

Long prestressed tees span air-terminal lobby

The longest and heaviest prestressed members to be cast in a commercial plant, trucked to the job site, and erected by cranes are the 152-foot Lin tees that span the main lobby of the new Phoenix, Ariz., Sky Harbor Passenger Terminal. The 22 girders, weighing 47½ tons each, span 84 feet between supports and then cantilever 34 feet more each way from the supports for the total length of 152 feet.

Smaller units

In addition to the long tees in the lobby roof, approximately 100 smaller tees make up the roofs of other sections of the structure. These members have 65-foot simple spans.

The attractive new terminal facilities at the busy airport are being constructed by the Chanen Construction Co., Inc., Phoenix, under a $[illegible] million contract with the city of Phoenix. The structure was designed by the associated architectural firms of Lescher & Mahoney, Ltd. (represented by Robert B. Helgeson) and Weaver & Drover (represented by Hermann Jacobi), with Walter E. Riley serving as structural engineer for the project.

Tee producer

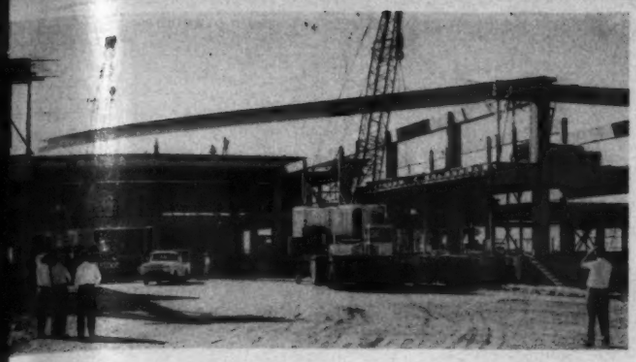
The tees were produced by the prestress division of the Arizona Sand & Rock Co., Inc., Phoenix. They were trucked to the site and erected by the Owl Trucking Co., Los Angeles. T.Y. Lin & Associates served as consultant on the design of the prestressed members.

The structure consists of a long single-story ticketing wing, a multistory section that includes the [illegible] lobby, baggage facilities between the ticketing and lobby sections, and a long loading finger extending [illegible] from the multistory section. The entire structure is air-conditioned.

Precast panels

The exterior consists of glass and metal curtain walls and precast Mo-Sai panels with exposed aggregate of a tan color. The panels were supplied by the Otto Buehner Co., Salt Lake City.

The building is essentially a reinforced-concrete frame founded on spread footings with square columns



◄ Two big motor cranes rated at 60 tons set a girder, the Lima standing in one position and swinging around, while an American with rolling outriggers walks the member into place.

Concrete is chuted from a Challenge mixer on a Cook Bros. truck to the girders and is vibrated into the webs. The mix for the girders is supplied from Arizona Sand & Rock Co.'s plant across the street. ►

and pan floors. An exception is the "bridge" section over the baggage ramp. This unit is framed with steel and decked with Acme steel decking with a topping of lightweight concrete. The long finger structure is also of steel-frame construction.

Both sides of the multistory building had to be built up to the full height to provide the bearing for the long roof tees before they could be placed. However, the central lobby area could not be excavated to basement grade until after the tees were set, since the cranes had to operate from this area to place the heavy girders.

Strands harped in two directions

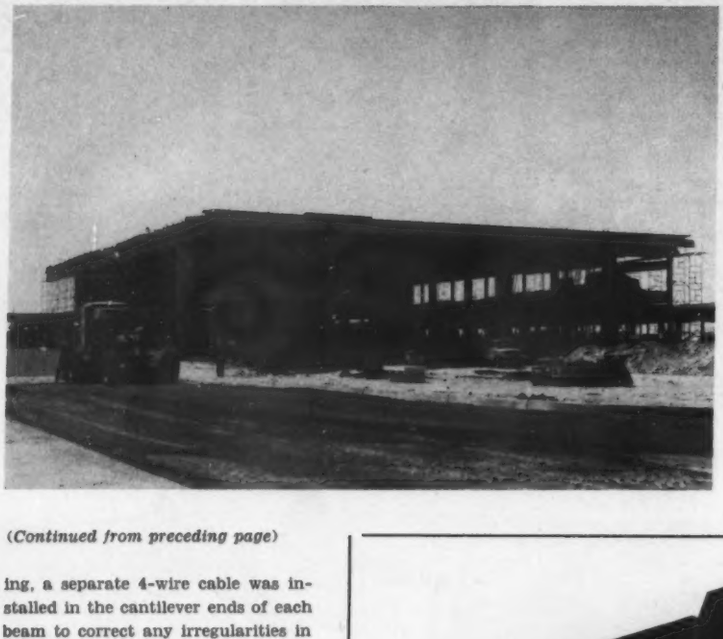
The 152-foot-long tee girders were cast two at a time in a bed 306 feet long at Arizona Sand & Rock Co.'s prestressing plant. These tees are 36 inches deep and 8 feet wide. The webs are 8 inches wide, and the flanges taper from 4½ to 1½ inches thick. The reinforcing consists of 14 half-inch pretensioned strands (by CF&I) and two Prescon 16-wire post-tensioning cables.

The pretensioned strands were harped at three points to handle the double cantilever stresses. Ten of these strands start in the flanges and four in the webs. At the harping points, the strands in the flanges were harped horizontally to move them over into the web so that they could be harped vertically. The post-tensioning cables were draped to approximately the same shape, with modifications to accommodate the variable dead load of the roof. The roof over the tees consists of 2 to 10 inches of lightweight concrete sloped for drainage.

In addition to the main reinforc-

(*Continued on next page*)

Care is exercised to assure the uniform tensioning of all cables in the long beams. Each cable was tensioned individually, and the tension in each was accurately measured by this Dillon remote indicating load cell system.



At the left, the roof tees are all in place, spanning 84 feet between the supports and cantilevering 34 feet on both sides. Above, the view inside the main lobby area shows columns completed or under construction to support the lobby floor. The main lobby area is two stories high.

(*Continued from preceding page*)

ing, a separate 4-wire cable was installed in the cantilever ends of each beam to correct any irregularities in deflection and keep all of the girders in perfect alignment. None of these cables were actually tensioned, since the girders lined up perfectly without them. However, they are available for use in the future should there be any tendency for unequal deflection of the cantilevered ends.

Pretensioned with load cell

In order to be sure of the correct tension in all of the prestressing cables, the stressing crew used a Dillon remote indicating load cell system to measure the tension in each strand and cable.

When the forms were set and the pretensioning strands placed, stressed, and harped, the 8-sack high-early-strength concrete was delivered in transit mixers and placed in the forms. Wyco electric vibrators worked the concrete down into the web, and a Stow vibrating screed was used to strike off the top of the flanges.

The exposed top flange was sprayed with curing compound, and the entire form was covered with tarpaulins for the 1-day curing period. The tees were then picked out of the forms and placed in storage in the yard. The Prescon post-tensioning cables were stressed in the yard before the girders were moved to the airport.

After the girders were cured and post-tensioned, every other one was actually load-tested in the yard. They were set up on temporary supports, and loads in excess of the assumed dead and live loads were applied. None of the girders showed any distress under this test loading.

In one location, a large square opening was cut out of the flanges of two adjacent girders. These two were set up side by side, and the full live and dead loads were applied. Like the others, these came through with flying colors.

Cross airport runway

Girders 152 feet long are an unwieldy load on the highway, but Owl Trucking Co. handled them nicely, using two 12-wheel dollies under the bearing points of each girder and towing them with a ballasted Chal-

lenge-Cook Bros. truck.

To reach the building site at the airport, the haul rigs had to cross the main runway and taxiway of the busy airport. To avoid conflict with the air traffic they used a radio-equipped guide car that was in constant communication with the control tower of the field. There were no incidents.

Owl used two of the truck and dolly combinations, which were able to deliver the tees as fast as two big motor cranes could set them.

Two cranes set girders

Because of the restricted space within the partially completed building and because of the necessity of lifting the heavy sections more than two stories, two big motor cranes had all they could do to place the tees.

One of the cranes, a 60-ton Lima, was stationed inside the building where it could pick one end of the girder off the dolly and swing it into position without traveling. The other crane, a 60-ton American equipped with rolling outriggers, picked the other end and walked the girder into place.

The dollies were backed into the space in the building with the girders nearly perpendicular to their final position in the roof. The two cranes picked them off the dollies, which were then pulled out. The cranes raised the girders straight up until they were high enough to clear the concrete building frame. Then, with this 47½-ton load swinging that high in the air, the American crane backed in until the girder could be set.

All the tees tested took in excess of design loads without damage. These adjacent beams have a uniform load to test their strength with the large cutout (at center).

In spite of the difficulty and the complications, the 22 girders were erected in just four days.

The smaller tees in other portions of the building were cast by the Arizona Sand & Rock Co. in the same forms. Their prestressing cables were ½-inch strands, coated and wrapped to prevent bonding and post-tensioned after the girders were erected. These strands were held with Atlas anchors. The tees, which have 65-foot simple spans, are 8 feet wide and 20 inches deep.

Excavate lobby basement

With the roof tees in place, a Michigan 175A tractor shovel and trucks excavated the lobby area down to basement level. The forming and concrete crews then built up the columns, beams, and pan floors of the lobby, and completed the remainder of the reinforced-concrete structure.

Some of the exposed concrete retaining walls around the structure, including those on both sides of the depressed baggage ramp, were given an unusual surface treatment. The contractor applied Rugasol-F, a retarding agent by Sika Chemical Co., to the face forms for these walls just before the concrete was cast. As soon as the forms were removed, these walls were washed down to remove some of the mortar and leave the aggregate exposed.

Personnel

For the Chanen Construction Co., George Hickman, general superintendent, keeps a close eye on most of the job activities. Milo Griffin is job superintendent.

The superintendent of airports for the city of Phoenix is William J. Ralston. THE END

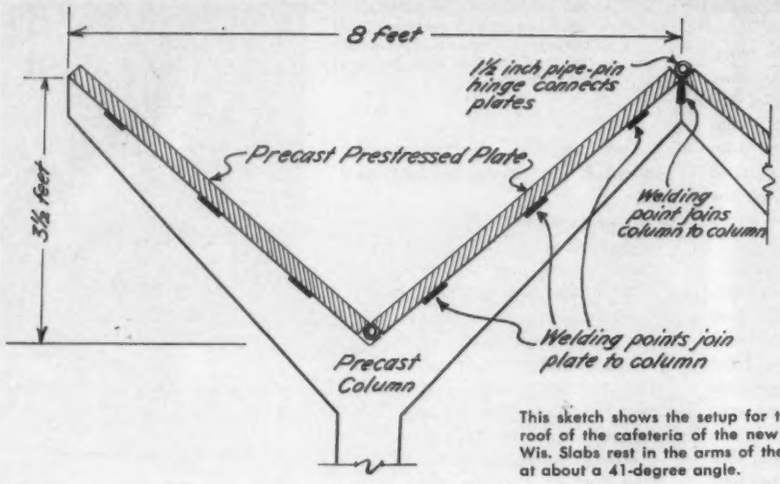
Spain builds its first prestressed water tanks

■ The economies of prestressed concrete are especially important to the city of Oviedo in northern Spain.

Five 3.3-million-gallon tanks were designed and prestressed by The Preload Co., Inc., New York, N. Y., and its affiliate, Preload Iberica of Madrid. The tanks are 131 feet in diameter, 33 feet high, and 8 inches thick.

Metal panels for forms were made up by local industry and the same forms were used for all tanks. Panels for inside forms for a given segment were assembled the full height of a tank. Outside forms for the same segment were installed in increments of several feet.

Preload Co. prestressed the tanks in the usual manner, with a self-propelled wire-winding rig suspended along the outer wall from a traveling carriage. After the prestressing operation was completed, the firm weatherproofed the prestressing wires with decorative coats of pneumatically applied mortar. Piping was then completed, and the tanks were placed in service.



This sketch shows the setup for the prestressed folded-plate roof of the cafeteria of the new high school in Eau Claire, Wis. Slabs rest in the arms of the Y-shaped precast columns at about a 41-degree angle.

For a high-school roof,

Spectacular prestressed members

by BILL ALLEN, field editor

Prestressed concrete in many spectacular shapes and sizes forms the entire roofing system of a $3.4 million high school in Eau Claire, Wis.

Giant tees, 8 feet wide and 99 feet long, span between the masonry walls of the gymnasium.

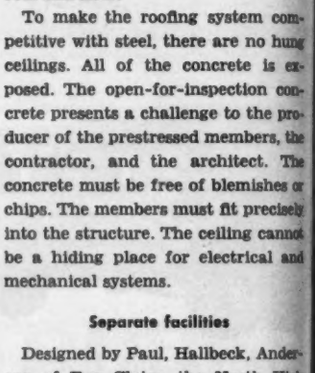
Prestressed folded plates resting on precast Y-shaped columns make up the unique roof system of the cafeteria.

Roofing the classrooms are prestressed joists supporting lightweight concrete planks. In certain areas in the building, double tees form the roof and floor.

To make the roofing system competitive with steel, there are no hung ceilings. All of the concrete is exposed. The open-for-inspection concrete presents a challenge to the producer of the prestressed members, the contractor, and the architect. The concrete must be free of blemishes or chips. The members must fit precisely into the structure. The ceiling cannot be a hiding place for electrical and mechanical systems.

Separate facilities

Designed by Paul, Hallbeck, Anderson of Eau Claire, the North High School will provide facilities for 600 junior high and 600 senior high students. In the design of the 213,683-square-foot building complex, the



The exterior columns of the cafeteria on 12-foot centers, support the outer half-plate of the roof; the interior columns stand with the tips of the Y's touching. Prestressed beams tie columns to the masonry wall of the gym at right. Note the adjustable pipe braces used to plumb the columns.

One of the giant tees for the gymnasium arrives on the job, carried by a tractor and a dolly rig that can be steered around corners so that twisting forces on the member are eliminated. The dolly is actually an old tractor chassis cut down.

Two 25-ton cranes position a tee using lifting points cast into the member. The Link-Belt remains stationary while the American walks forward into the area so that the tee can be set.

classrooms and other facilities for the two age groups are generally kept separate.

In the large box-shaped gymnasium, a movable partition separates the juniors from the seniors. Eating facilities in the two cafeterias are separated by a common kitchen area. The two groups alternate, however, in the use of the swimming pool and 675-seat auditorium.

In a departure from standard design, the window area in the 1-story masonry walls is held at a minimum. Each classroom has one 7 × 7-foot window at the rear. This has several advantages. It permits better control of the fluorescent lighting. In the winter there is less heat loss; in summer, the room stays cooler. The solid walls, however, are a disadvantage for children who like to look out the window.

The utilities serving the building are handled in an unusual manner. All the electrical and mechanical piping systems are carried in about three-quarters of a mile of walk-through concrete tunnel just below ground-floor level. In some places, mechanical equipment is stationed in the tunnel. The tunnel itself becomes a carrier for a part of the exhaust ventilation system.

Bor-Son Construction, Inc., Minneapolis, holder of the $2,032,500 general contract, started excavation for the building in April of 1961. The company expects to complete the work by August of 1962. The prestressed members are produced at the nearby plant of Eau Claire Stresscrete, Inc. (See page 50.) Paul V. Farmer, Inc., Eau Claire, erects the members under a contract with Stresscrete.

Prestressed folded plate

Perhaps the most unusual part of the construction is the prestressed folded-plate roof of the cafeteria. This 184 × 79-foot 1-story structure is joined on one side by the classroom complex and on the other side by the gym-auditorium-shop area.

The long precast, prestressed roof slabs rest at about a 41-degree angle in the arms of precast Y-shaped columns. Along the length of the building, the folded plates make three spans of 60, 48 and 60 feet, with an 8-

(Continued on next page)

◄ Concrete for the 7-foot-high tunnels that will carry electrical and mechanical systems for the building is brought from a Rex mixer on a Mack truck to the Economy steel forms by a Prime-Mover buggy.

The 3-inch-wide filler blocks hold the keystone roof joists upright and fill the 4-foot gap between the joists. All brick and block walls in the building are load bearing. ►

(Continued from preceding page)

foot overhang on each end of the building.

With the tips of the Y's welded together, the 25-foot-high columns form a sawtooth pattern. The connecting interior columns are on 8-foot centers. Exterior columns, to support the outside half-plate, are on 12-foot centers. The columns rise from individual footings in the tunnel space, making a floor-to-ceiling height of 18 feet.

Columns erected with precision

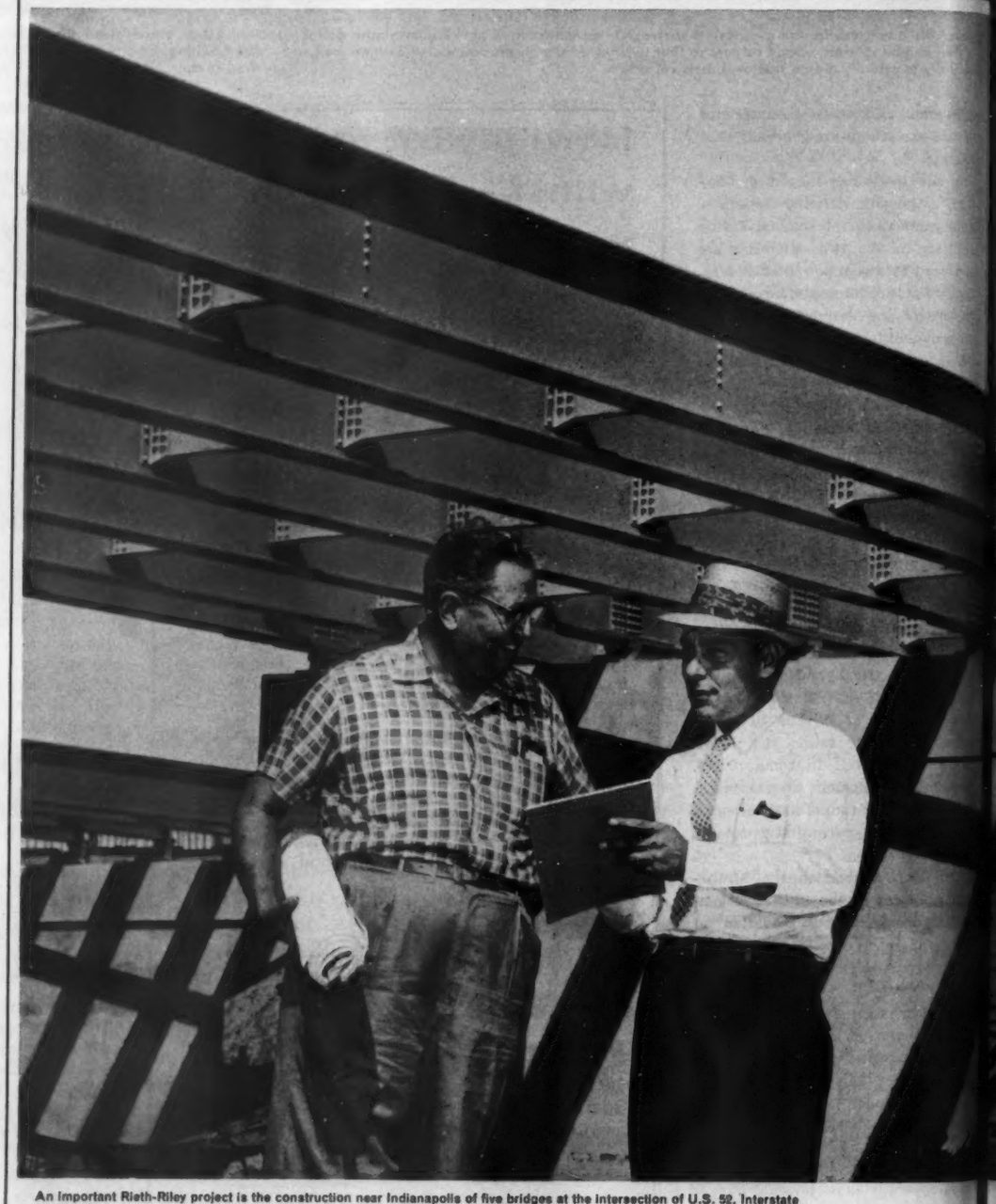
Extreme care must be taken in erecting the columns, for they must fit into the roof system with jigsaw puzzle precision. Using a Link-Belt 30-ton mobile crane, the erection subcontractor picks up each column at two points. One point is an eye screwed into an insert at the crotch of the Y. The other point is a loop of cable cast into the lower part of the column. (This is later burned off.) After the column is lifted into the air, the load is shifted entirely to the "crotch" lifting point, allowing the column to hang plumb.

In place on four anchor bolts, the column is brought into plumb by two adjustable pipe braces. The final position is checked by a transit. After several columns have been erected side by side, the tips of the Y's are welded together.

In order to take advantage of the inherent strength of a folded-plate member, two individual plates are hinged together at the plant to form a V-section. Temporary struts are welded across the top of the V to hold the two plates in position. The V-section is then trucked to the job site, and erected by one and sometimes two cranes. On the roof, the ends of each plate are welded at three points to the arm of the Y. Pins are thrust through the pipes at the upper edges of the plate to make the hinge connection with the adjoining V-section. After the plates are in place, the hinge action is stopped by welding.

Wood blocks fill the gaps between the hinges on the upper joint. The plates are finally covered with 1½ inches of rigid insulation topped with a built-up roof. On the exposed underside of the roof, an aluminum shield conceals the lower hinged joint.

Giant tees, varying in length from 73 to 107 feet, make up the roofs of the gym, swimming pool, and audi-



An important Rieth-Riley project is the construction near Indianapolis of five bridges at the intersection of U.S. 52, Interstate 465 and Bypass 100. Here Miles Shookman checks service and delivery requirements with bridge superintendent H. P. Kunkler.

BY MILES SHOOKMAN

About the Author. Operating out of Indianapolis, Miles Shookman has the job of providing specialized service to construction contractors in his territory. A graduate of Indiana University, Miles is well qualified for this important assignment. He has been doing this work for much of the 15 years he's been with the company, and also attended the Company's Sales Engineering School.

★ ★ ★

Rieth-Riley Construction Company, Inc., is a large, highly diversified contracting firm with headquarters in Goshen, Indiana. As "Contractor Representative" for American Oil Company, I work closely with Rieth-Riley to provide the specialized service needed for construction operations. This means visiting widely scattered projects to make sure the company gets the right product in the right place at the right time—*always*. Specializing in highway, bridge and street projects, Rieth-Riley owns and operates a large number of complicated and expensive pieces of equipment. Years of experience has taught the importance of uniform maintenance practices and consolidated fuel and lubrication programs. That's why Rieth-Riley depends on American Oil

torium. Made of lightweight concrete, the large members have a 3-foot stem containing the prestressing strands, and an 8-foot cover. Cast into the ends of the tees are filler blocks that provide additional bearing surface. The tees are supported at their ends by masonry walls.

In the construction, the 16-inch masonry walls go up first. They are built of 12-inch lightweight block with a 4-inch brick facing. The U-shaped top block is a form for a poured-in-place bond beam. On the beams rest the ends of the giant tees.

Each tee arrives on the job carried by a tractor and dolly rig. The rear dolly can be steered around corners to eliminate any twisting forces on the long concrete member. On the job site, the 27-ton tee is picked up by two cranes and carefully raised into position. Each crane grabs the tee at one end by two lifting points over the stem. Each lifting point consists of a loop of three ½-inch cables enclosed in a conduit. The lifting cables are later burned off.

On the roof, the tees are placed side by side and connected by welding points at their edges. Consistent quality of the long cambered members permits the edges to line up generally within ¼ inch. After welding, the concrete surface is leveled with a ½-inch course of grout. This receives 1½ inches of rigid insulation followed by a built-up roof.

Connections between edges of the 8-foot-wide tees forming the roof over the swimming pool are made by crew member with a Sureweld 200-amp unit.

Prestressed joists

Classrooms and other shorter-span areas are generally roofed with prestressed joists supporting lightweight precast planks. The 16-inch keystone joists (from 12 to 40 feet in length) are set on the masonry bearing walls at 4-foot centers. Three-inch-thick concrete filler blocks hold the joists upright and fill in the gap between the joists. Spanning the 4 feet between the joists are 2-foot-wide precast planks. Made with a perlite aggregate at the yard of Western Mineral Products Co., the extremely lightweight slabs serve also as an insulator. The slabs are grouted in place to the top of the joists and receive a built-up roof.

Personnel

The superintendent for the general contractor is J. W. Johnson. In charge of the erection of the prestressed members is Ronald Farmer. For the architect, James R. Hallbeck is the project designer and James W. Young is the field representative. THE END

New curing blanket cuts costs for prestress firm

■ A saving of approximately 5 cents per surface square foot in curing precast, prestressed concrete is being claimed by Missouri Pres-Crete, Inc., Overland, Mo., after testing a fabric film called Griffolyn type 65 HD. This material features a grid of nonwoven nylon fibers floating between films of polyethylene. The fibers provide high tear resistance by bunching up against tear progression, without the need of costly tensile strength.

There is an additional saving in labor costs because the light weight of the material requires fewer men.

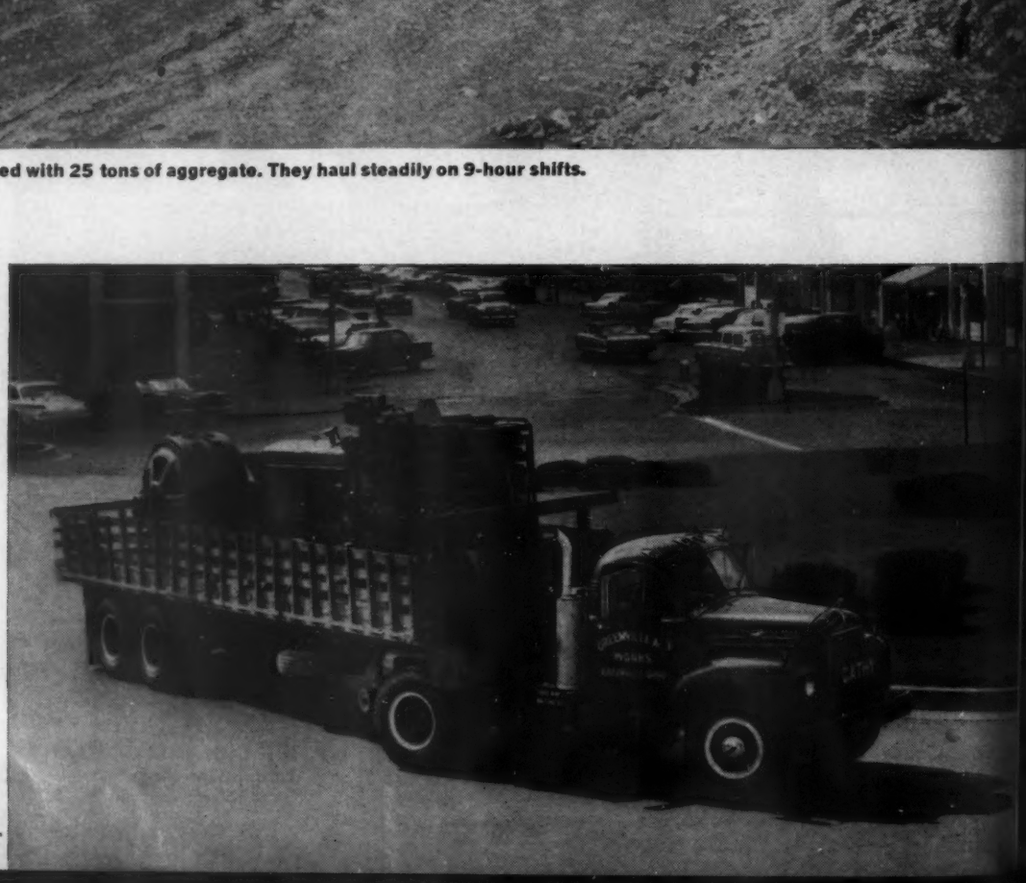
ASME moves to new New York headquarters

■ The American Society of Mechanical Engineers is now located on three floors of the new United Engineering Center, 345 E. 47th St., New York 17, N. Y.

The center, which is across the street from the United Nations, also houses 18 other engineering societies. It offers expanded library space, facilities for indexing and abstracting technical literature, meeting and conference rooms, exhibit space, and a cafeteria.

The move to new headquarters provides dual advantages; adequate space for the growing society and closer association with similar professional engineering organizations.

Mack-drawn hoppers at the pit are loaded with 25 tons of aggregate. They haul steadily on 9-hour shifts.



Rolling out of home base at Greenville, Ohio, one of American Aggregates' Mack tractors delivers electrical equipment for a subsidiary company, Greenville Mfg. Works.

At American's Ft. Jefferson ready-mix plant Mack mixer units take on 6-yard loads of concrete for local delivery.

Where performance counts—

Moving big tonnage for American Aggregates Corp.

Throughout the Ohio Valley, the Mack trucks of American Aggregates Corporation are a familiar sight. In addition to being the country's largest sand and gravel suppliers, the company manufactures diverse products ranging from ready-mix concrete to electrical equipment. These broad operations have one thing in common—a reliance on Mack trucks and tractors to handle the many and varied hauling assignments.

Says American Aggregates' president, Mr. Edward Hole, "We've used Macks for over 20 years, so we speak from experience when we say that these trucks are capable of handling efficiently any hauling job we've ever tackled. Their performance is tops wherever we use them, and there's never been the slightest question about their durability, ruggedness and economy—4 mpg on our gas units and 7 mpg on our diesel-powered models."

American Aggregates' Ft. Jefferson sand and gravel operation is a model of efficiency. Bottom dump trailers hauled by Mack B60 series tractors, run 25-ton loads of aggregate over well kept haul roads from pit to processing plant on a 9-hour-a-day schedule . . . average nearly a quarter of a million tons a year. After processing the aggregate, Mack dumpers make deliveries to customers and to American Aggregates' big ready-mix operation where 6-yard Mack mixer units handle concrete deliveries.

Modern, efficient, high-volume operations like these depend on modern efficient equipment to keep operating costs low. Macks contribute to high efficiency because of their outstanding performance characteristics. Mack Thermodyne® gasoline and diesel engines provide plenty of power for fast get-aways under full loads. Traditional Mack construction throughout reduces downtime and maintenance.

These are basic reasons why Macks are first choice where profitable operations rely on truck performance . . . why a Mack will pay for itself again and again by delivering top work capability per dollar invested. Your Mack representative is qualified by knowledge and experience to help you determine the Mack models that most economically meet your trucking needs. Mack Trucks, Inc., Plainfield, New Jersey. Mack Trucks of Canada, Ltd., Toronto, Ontario.

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New directions in prestressed concrete

Capsule comments by some of the industry's leaders

In recent months, C&E's field editors have been taking the pulse of prestressed-concrete design, production, and construction throughout the country. Besides their coverage of actual jobs, they have talked to experts in all phases of this type of construction. Here are summaries of remarks by a few of these experts.

ROSS H. BRYAN, *Nashville, Tenn.; consulting engineer; chairman, Technical Activities Committee, Prestressed Concrete Institute:*

I look for decreased use of heavy members, and an increase in the use of precast assemblies of lighter members to form structural systems. Prefabricated skin covering members will also be made in plants under carefully controlled conditions, and this will lead to greater use of strong yet lightweight shells.

There will also be more completely prestressed buildings running to heights of 12 stories and above, and utilizing 3-dimensional prestressing of floors, beams, and columns.

One new phase we are working on in our office is the shift to post-tensioned connections for continuity and rigidity. This type of connection, which will replace much of the standard mild-steel-and-concrete type of connection, places the responsibility for construction of both members and joints with one contractor, thus simplifying the control and supervision of prestressed erection work.

BEN C. GERWICK, JR., *San Francisco; engineer, prestressed-concrete producer, and contractor; past president (1957–58), Prestressed Concrete Institute:*

I believe we will see a rapid expansion into longer-span bridges and other more complex structures composed of precast-concrete elements, joined and made monolithic through post-tensioning, with the joints being filled with either grout or epoxy. These methods are already widely used in Europe and Australia.

In the field of marine and harbor engineering, we have already seen the advantages of prestressed-concrete piling. Now prestressed sheet piles are gaining universal acceptance. There are several installations of prestressed fender piles, and a number of major structures utilizing precast and prestressed decks. The all-precast, prestressed marine structure has just arrived, and I think it will shortly gain acceptance as the standard.

In plant production methods, we are witnessing an evolution to ever more mechanized production methods. This, however, can only proceed hand-in-hand with the development of standardized prestressed elements and of new materials. I expect to see a rapid change in production technology, particularly with regard to such products as poles, railroad ties, roof and floor units, and piling.

DR. ARTHUR ANDERSON and **THOMAS W. ANDERSON,** *Tacoma, Wash.: consulting engineers; prestressed-concrete producers:*

Designers of prestressed-concrete structures will go to more sophisticated concepts for the better utilization of the technical potential of the material.

For example, the section, weight, and dead load of bridge girders can be materially reduced from the AASHO standards now commonly used. The state of Washington has taken a step in this direction, but we look to still lighter members and

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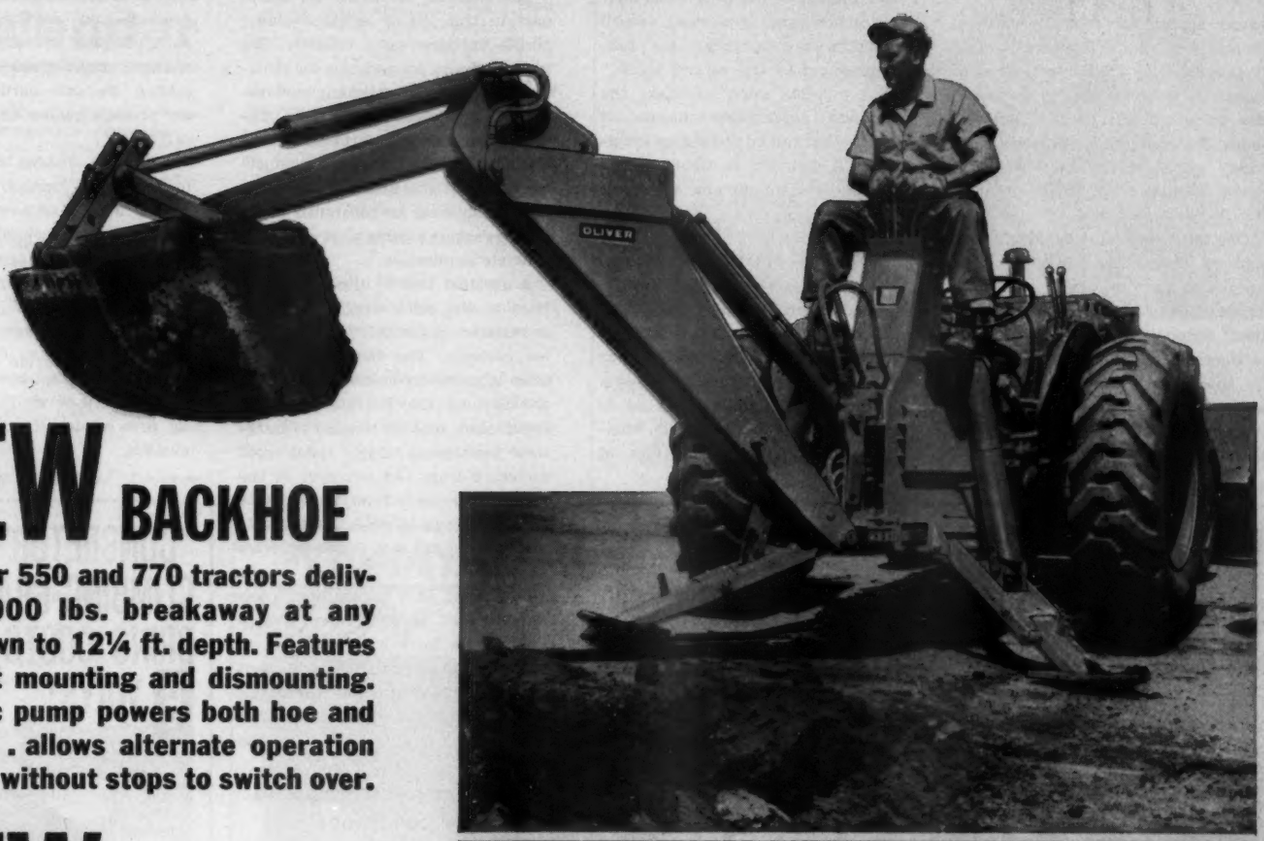

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(Continued from page 44)

longer spans. Barrel shells can be precast with thin pretensioned sections for spans up to 150 feet. We also expect to see greater use of the practice of assembling precast, pretensioned elements into larger structures, which are then tied together with post-tensioning cables strung through the series of elements.

One thing that must be done if design of prestressed-concrete structures is to move forward is that producers must raise the standards of their concrete quality. Everywhere, producers ought to produce uniformly good concrete with consistent strengths up to 7,500 psi at least. In this connection, we probably need research and testing facilities patterned, say, after those of the plywood industry—which is constantly seeking new uses for plywood, as well as monitoring the quality of the product produced by the various mills.

The industry must also take the initiative to develop new concepts and sections that can be utilized by architects and engineers in accomplishing the more elegant designs we expect from them.

NORMAN L. SCOTT, *executive secretary, Prestressed Concrete Institute:*

It seems to me that the big challenge our industry faces is to increase its share of the building market. Our product has many natural advantages for commercial building; it's up to the industry to sell architects, engineers, and owners on the idea of building with prestressed concrete.

The institute is taking an active part in this job of selling building people on prestressed concrete. We have programs for assisting the structural engineer in designing and inspecting this material. We have published a number of informational and technical bulletins, and are conducting an advertising program. Our technical committees are constantly working on various aspects of prestressed-concrete application.

A question that is often asked relates to the price trend as regards prestressed concrete. Take bridges, for example. The fact is that the price is gradually decreasing. Figures released by the Bureau of Public Roads show that the number of interstate prestressed bridges constructed increased from 13.6 per cent of the total in the years from 1957 to 1959 to 16.7 per cent in 1960. The percentage of the total cost decreased from 13.4 per cent to 11.1 per cent.

Our prices have always been lower as compared to steel, even though steel prices have been dropping to meet the competition. Prestressed concrete has the additional advantage, too, of having lower maintenance costs.

THE END

Tips on concrete exposed to winter conditions

■ Winter is tough on concrete pavement. Alternate freezing and thawing and constant use of de-icing agents contribute to surface scaling and sometimes the disintegration of concrete. Recommendations have been made by the Master Builders Co. for concrete that will be subjected to heavy wear and abuse.

1. *Air Entrainment.* Use of 5 to 6 per cent entrained air with 1½-inch top-size aggregate helps resist scaling and disintegration. For ¾-inch or 1-inch top-size aggregate, entrained air should be in the 6 to 7 per cent range.

2. *High-Strength Concrete.* Durability requires low water-cement ratios that produce low permeability and high-strength concrete. Adding water lowers strength and increases the likelihood of scaling. If increased workability is required, have the concrete mix altered at the plant.

3. *Quality Materials.* Coarse aggregate with a high percentage of unsound particles will contribute to pop-outs and scaling. Fine and coarse aggregate should meet ASTM C-33 or have a suitable service record. The cement should meet ASTM C-150, C-175, or C-205, should be of normal temperature at time of delivery, and should have no false or flash setting tendency.

4. *Workmanship.* Proper placing and finishing are essential to long-wearing surfaces. Quality of the concrete at the surface should be the same as that throughout the slab. Excessive or premature bullfloating, darbying, or hand or machine floating, particularly with metal tools, contributes to bleeding and reduces air content and durability of the surface.

5. *Curing.* Keep concrete moist and at an adequate temperature for as long as possible to provide proper hydration and maximum strength. More complete hydration and higher strength mean greater resistance to scaling. Be sure curing compounds are of high quality and apply them carefully.

6. *Surface Sealing.* Surface treatments of oil increase resistance to scaling, at least on new concrete. One such treatment consists of applying boiled linseed or mineral oil to clean, dry concrete. Don't apply salt to new, unsealed concrete. Where the presence of de-icing agents cannot be eliminated—such as drippings from automobiles—the concrete surface must be treated with a sealer before its first winter if scaling is to be avoided.

Convention Calendar

October 8–11 County Division of the American Road Builders' Association
Annual National Highway Conference, Broadview Hotel, Wichita, Kans. Ben F. Ostergren, managing director, County Division, ARBA, 600 World Center Bldg., Washington 6, D. C.

October 9–11 National Association of Corrosion Engineers
North Central Region meeting, Chase Park Plaza Hotel, St. Louis, Mo. Otto H. Fenner, Monsanto Chemical Co., 1700 S. 2nd St., St. Louis 4, Mo.

October 9–13 American Association of State Highway Officials
Meeting, Denver Hilton Hotel, Denver, Colo. Adolph Zulian, reservations chairman, Colorado State Highway Department, Denver, Colo.

October 15–19 Prestressed Concrete Institute
Annual convention, Brown Palace and Cosmopolitan Hotels, Denver, Colo. Norman L. Scott, executive secretary, PCI, 205 W. Wacker Drive, Chicago 6, Ill.

October 16–20 American Society of Civil Engineers
Annual convention, Statler-Hilton Hotel, New York, N. Y. Otis D. Gouty, assistant to the secretary, ASCE, 345 E. 47th St., New York 17, N. Y.

October 16–20 National Safety Council
National Safety Congress and Exposition, Conrad Hilton Hotel, Chicago, Ill. R. L. Forney, secretary, NSC, 425 N. Michigan Ave., Chicago 11, Ill.

October 17–18 Bulk Solids Handling Symposium
Conference sponsored by ASME and the American Materials Handling Society, Pick-Nicollet Hotel, Minneapolis, Minn. ASME, 345 E. 47th St., New York 17, N. Y.

October 19–20 Preparing Construction Contracts and Specifications
Institute to be held at the University of Wisconsin in Madison. Sponsored by the university and the Construction Specification Institute. E. O. Busby, institute coordinator, 3040 Stadium, The University of Wisconsin, Extension Division, Madison 6, Wis.

October 19–20 National Conference on Industrial Hydraulics
17th annual national conference at the Sherman Hotel, Chicago, Ill. James Stathas, Public Relations, Illinois Institute of Technology, Technology Center, Chicago 16, Ill.

October 19–21 National Society of Professional Engineers
Fall meeting, Hotel Roanoke, Roanoke, Va. Kenneth E. Trombley, NSPE, 2029 K St. N.W., Washington 6, D. C.

October 23–26 National Association of Corrosion Engineers
South Central Region conference and exhibition, Shamrock Hilton Hotel, Houston, Texas. T. J. Hull, executive secretary, 1061 M & M Bldg., Houston 2, Texas.

November 1–3 American Concrete Institute
Fourteenth regional meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala. ACI, P. O. Box 4754, Redford Station, Detroit 19, Mich.

November 6–7 U. S. Government Construction Contracts Conference
Conference and dinner, Lisner Auditorium, George Washington University, Washington, D. C., and Statler Hilton Hotel, Washington, D. C. CCC, The National Law Center, George Washington University, Washington 6, D. C.

November 13–18 Short Course on Concrete and Concrete Aggregates
Annual course held at the University of Maryland, College Park, Md. Stanton Walker, National Sand & Gravel Assn., 1411 K St. N.W., Washington 5, D. C.

November 17–18 Bituminous Concrete Highway Conference
Conference to be held at University Park, Pa. For further information write the Continuing Education Conference Center, The Pennsylvania State University, University Park, Pa.

November 27–30 American Institute of Steel Construction
Annual convention, Boca Raton Hotel and Club, Boca Raton, Fla. L. Abbett Post, executive vice president, AISC, 101 Park Ave., New York 17, N. Y.

December 11–14 Wood Society of America
Meeting, Sheraton Jefferson Hotel, St. Louis, Mo. Dr. O. Hale Fletchall, College of Agriculture, University of Missouri, Columbia, Mo.

Massachusetts route map

■ A 16-page, 4-color official route map for 1960–1961 has been released by the Massachusetts Department of Public Works.

The map may be obtained free of charge from the Department of Public Works, 100 Nashua St., Boston 14, Mass.

The Bookshelf

Time-savers for design of prestress structures

Prestressed Concrete, Design and Construction by James R. Libby. 468 pages. Published by the Ronald Press Co., 15 E. 26th St., New York 10, N. Y. $12.50.

One of the major deterrents to the use of prestressed concrete in all forms of construction has been the amount of time required to design prestressed structures. James Libby has bridged, in this book, the gap between theoretical considerations and practical design methods. The theorems and methods that are explained can be applied in many different ways and can be modified by the individual designer for special conditions.

The first part of his book is devoted to the basic concepts and the principles of flexure analysis. Then follows a detailed treatment of flexure analysis as it is applied to the design of structural members. Finally, the practical considerations of prestressed concrete are discussed, such as prestressing plant operations, pre and post-tensioning equipment and techniques, and fabricating procedures.

English handbook on prestressed concrete

Prestressed Concrete Simply Explained by H. Kaylor. 158 pages. Published by John Wiley & Sons, Inc., 440 Park Ave. S., New York 16, N. Y. $5.25.

A book designed to help engineers and architects use prestressed concrete with a greater understanding of its potential has been written by H. Kaylor, who has been closely associated with original research work carried out in England and with the practical application of prestressed concrete.

Chapters of this useful book cover: basic principles; methods and applications; materials required; losses of prestress; design of simply supported beams; examples of design; composite construction; liquid-retaining structures; and potential uses.

Free booklet lists 21 prestressed structures

Prestressed Concrete—Applications and Advantages. 20 pages. Published by Prestressed Concrete Institute, 205 W. Wacker Drive, Chicago 6, Ill. Free.

Twenty-one types of structures in which prestressed concrete is used and the reasons why are covered in this illustrated booklet, written in nontechnical language.

Marina construction

Marinas: Recommendations for Design, Construction and Maintenance by Charles A. Chaney. 247 pages. Published by the National Association of Engine and Boat Manufacturers, 420 Lexington Ave., New York 17, N. Y. $7.50.

This book is designed to enable engineers to design and construct water-front facilities for small craft without the necessity for extensive research and expensive inspections of existing harbors.

The subject has been divided into 26 chapters that, along with many drawings, tables, and diagrams, thoroughly cover the factors involved in the selection of site and type of construction, formulation of rules controlling clearances, sizes and capacities of marinas, selection of the proper materials, suggestions for design of major elements with a view to economy and permanence in construction, data on costs, rental values and operation, maintenance comments, and financing.

Traffic-control devices treated in new book

Manual on Uniform Traffic Control Devices for Streets and Highways prepared by the National Joint Committee on Uniform Traffic Control Devices. 333 pages. Published by the Bureau of Public Roads, U. S. Department of Commerce. Order from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $3.

A revision of the 1948 manual includes for the first time specific standards for expressway signs, a major section on signs and markings for construction and maintenance operations, and some material on civil defense signs.

Tested traffic-control practices in the design and application of control devices, and the results of research into the principles of safe vehicle and pedestrian movement are covered.

The new manual eliminates certain alternatives in traffic-control techniques and gives a single standard. For example, according to the manual, the stripe to mark a no-passing zone will in future be marked with a yellow line to the right of the center stripe.

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American cities—where are they going?

The Future of Our Cities by Robert A. Futterman. Illustrated with 71 maps and diagrams. 360 pages. Published by Doubleday & Co., 575 Madison Ave., New York 22, N. Y. $4.95.

Robert Futterman is a real-estate man with some provocative ideas about municipal problems now confronting this country. Administrators, city planners, legislators, and architects may not agree with him, but they should appreciate some fresh thinking on the past, present, and future of America's metropolitan areas. In the book, the author analyzes the elements that affect an area's life or death: transportation, geography, politics, planning. He also takes a city-by-city look at America's metropolitan areas, and discusses their prospects for future development.

What makes city driving hazardous?

Bulletin 271: Increasing Traffic Capacity of Arterial Streets. 68 pages. Published by the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C. $1.60.

A major commuter route into Washington, D.C., has been turned into a "test-tube highway" in an attempt to find out what makes driving hazardous and what can be done to smooth the flow of traffic in a city traffic artery.

Three research engineers, a psychologist, and an attorney with the U.S. Bureau of Public Roads present the results of this study in papers on tension responses of drivers generated on urban streets; increasing the traffic-carrying capability of urban arterial streets; application of police power and planning controls to arterial streets; and traffic signals and signal timing.

A report of the committee on Highway Capacity concludes the bulletin.

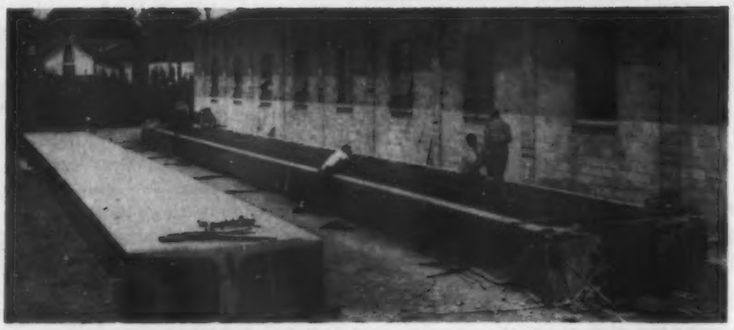
The behavior of fluids at rest and in motion

Fluid Mechanics by Richard H. F. Pao. 502 pages. Published by John Wiley & Sons, Inc., 440 Park Ave. S., New York 16, N. Y. $7.50.

This book, intended for an introductory course in fluid mechanics, emphasizes the principles of fluid motion common to applications in all branches of the engineering profession.

Physical concepts are stressed. Numerous illustrative examples are included to develop analytical ability in attacking various problems in the field.

Unique prestressed roof challenges producer



Giant tees, 99 feet long, 8 feet wide, and with a 3-foot stem, are being cast by Eau Claire Stresscrete, Inc., Eau Claire, Wis., for the new high school in that city. Crews set reinforcing on the 120-foot tee bed; a tee completed the day before is in steel filler-block forms.

(Additional photo on front cover)

Eau Claire Stresscrete, Inc., Eau Claire, Wis., combines precision and production as their men make the unusual prestressed members that form the roof of a 200,000-square-foot high school.

On a daily cycle, crews turn out a comparatively new addition to the prestressing industry—the giant tee. With an 8-foot width and 3-foot stem, the lightweight concrete member is produced in lengths up to 107 feet.

The unique prestressed folded-plate roof of the high school's cafeteria presents handling and erection problems. The individual prestressed plates are hinged together with their ends resting on precast Y-shaped columns. The members are hinged together on a column mock-up in the yard to make sure the plates fit in the field. The two plates form a V-section. With temporary struts welded across the top of the V, the section is transported and erected.

Forming the 25-foot Y-shaped columns is tricky, for there can be no chamfer at the corners. To tie in with each other and with the plates, the corners of the columns must have sharp angles. Specially fabricated forms of steel solve the problem.

Since there are no hung ceilings in the high school, and all of the prestressed members are exposed, crews must use all their skill to give the members a marblelike finish.

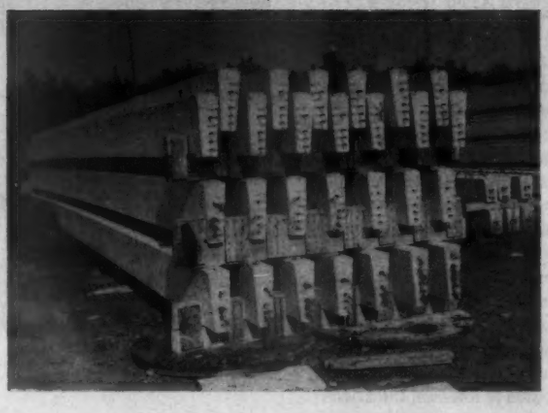
The precast and prestressed members will form the entire roofing system of the $3.4 million North High School in Eau Claire. The swimming pool, gym, and auditorium will be roofed with giant tees resting on masonry walls. In the classrooms, prestressed keystone roof joists will support precast lightweight planks. For details on the building and on-site construction, see page 38.

Giant tee production

The company has built a 120-foot-long steam-heated bed for fabricating the giant tees. The stem of the Valley steel form is encased in two heavily reinforced concrete beams that run for the length of the bed. The beams resist the compressive force exerted by the tensioning of the strands. Piping within the beams carries the steam for radiant curing.

Fabrication steps begin with the Roebling ½-inch strands being cut to length and strung out alongside the

Y columns 25 feet high are completed in special forms made by Valley Mfg. Co., Valley, Nebr., which also supplied the steel tee forms. The lead man uses a Wyco vibrator; the follow-up man hand-floats and then finishes the exposed surface. These columns support the prestressed folded-plate roof of the high-school cafeteria.



Prestressed keystone roof joists that support lightweight concrete planks are racked in the yard and ready for shipment to the job site. Measuring 16 inches, these units run from 40 to 12 feet in length and were produced in 3 and 4-row beds 90 feet long.

bed. For the 99-foot girders, the 14 lower strands are then rolled into place by hand and secured with Supreme strand vises at their ends. A G. T. Bynum 20-ton hydraulic jack tensions this group individually to 25,200 initial tension per strand, before the eight upper depressed strands are set in position. Each of the upper strands is threaded through two hold-down devices and pulled to the same initial tension.

Wire mesh (8 × 4 — 9 × 3) is then rolled out on the form to cover the 8-foot width. A light network of reinforcing steel is wired in place on top of the mesh. No. 4 bars dip into the stem on 12-inch centers. Blocks of ½-inch steel, previously welded to transverse bars, make up the welding points at the edges of the tee.

Money is saved on lifting points by making them out of scrap lengths of ½-inch strand. Three lengths are threaded through a short piece of electrical conduit. The unit is then bent into a U shape. Four lifting points, two on each end, go into the 27-ton girder.

End bulkheads are of steel. Each is clamped in place at the upper ends of the tee. Steel lugs, clamped onto the strands, hold the stem of the bulkhead in position.

Concrete for the giant tee rolls alongside the forms in transit-mix trucks. Concrete is lightweight with a Materialite aggregate. Mixed with 7½ sacks of high-early cement per cubic yard, the concrete contains a Pozzolith additive. For workability and a good finish, the mix is placed with about a 3-inch slump. Although this is admittedly wet concrete, the company finds that the mix still yields sufficient strength.

When concrete is placed, the stems are thoroughly vibrated with a Thor

(Continued on next page)

(Continued from preceding page)

electric vibrator. The top of the tee is vibrated as it is struck off with a double-bladed vibrating screed. A small amount of hand floating finishes off the surface.

The freshly placed concrete is allowed to set for two hours before steam is turned on. The member then gets about 12 hours of steam curing at 160 degrees. By early morning of the day following concrete placement, a member has generally reached a compressive strength of 3,500 psi, at which time the strands can be cut.

After tension is released, the 27-ton tee is picked up by two 12-ton Travelifts (straining a little bit). The straddle-type rigs carry the tee to a pair of end-block forms in an adjoining work area. These steel forms make the filler blocks that close the ends of the tee and also provide additional bearing. Three heavy reinforcing rods, going through holes in the stem, tie the end-block to the tee. The concrete is poured through long narrow holes previously formed in the wings of the tee.

Extra care must be taken in storing the giant tees. Members must be set down on well founded level blocks so that twisting forces are avoided.

Folded-plate components

There is no great problem in turning out the individual components of the folded-plate roof, but special techniques are needed in their handling and erection. The individual plates are 5¼-foot-wide 2½-inch-thick slabs of 48 and 68-foot lengths. Made of standard-weight concrete, they are stressed with either six or eight (eight for the longer span) 7/16-inch strands.

The individual slabs are formed on a 70-foot-long concrete bed. Since the bottom form is concrete, the exposed surface is given a fine hand-trowel finish.

After the individual slabs, or plates, are completed, they are lifted to a mock-up consisting of four Y-shaped columns. Although these are only about 5 feet high, their tops are identical to those in the building. With the plates fitted to the column yoke, the pipe hinges are welded to angles

A 99-foot 27-ton tee is stored on wood blocks in the yard, after workmen have made sure the blocks are level so that twisting forces in the member are eliminated. A carpenter's level is used to check the resting position.

◄ Roebling ½-inch strands are slipped through Supreme strand vises and strands are stressed individually to an initial tension of 25,200 pounds each by means of a 20-ton hydraulic jack.

After mesh and welding plates are in place, reinforcing is set. This man is wiring crane lifting points in place. Each has three lengths of ½-inch strand in a conduit. ►

Lightweight concrete, placed with about 3-inch slump for workability and a good finished surface, is chuted to the forms. A Thor vibrator is used to consolidate the stem while a vibrating screed, right, consolidates the thin paper section.

cast into the concrete. After the hinge connections are made at the bottom of each V-section, iron struts are welded across the tops of the V. The rigid 2-plate section is then trucked to the job and set in place by cranes. The end of each plate is welded at three points to one arm of the column.

The 66 columns that support the folded-plate roof are cast in a single Y-shaped mold. The steel form, with its sharp angle corners, was manufactured by Valley Mfg. Co., Valley, Nebr. Made of heavily reinforced, standard-weight concrete, each 25-foot-high (from bottom to crotch) column generally contains 6 welding plates on the arms and one on each of the tips.

On the 4-row, 90-foot-long joist bed, men depress the strands at one point within each joist with the aid of hydraulic jacking equipment. Strands are first stressed, and then depressed by the crew.

Seven miles of joists

Stresscrete will produce about 7 miles of keystone joists for the smaller spans of the classrooms. The 16-inch joists vary in length from 40 to 12 feet. The prestressed members are produced under roof in one of the two joist beds. The 3 and 4-row beds are both 90 feet long. On the longer spans, the strands are depressed at the center by an overhead jack. With steam curing, the joists move out of the beds on a daily cycle.

From bridges to buildings

Eau Claire Stesscrete set up its yard in the spring of 1958. With two 220-foot girder beds, the company entered the new field of prestressed-girder bridges. Since that time, the business has expanded and gradually shifted from girders to prestressed building components. At the present time, about 80 per cent of production goes into commercial building.

With 13 prestressing beds, most of which are under roof, the company produces many different sizes of double tees, single tees, beams, joists, flat slabs, and girders. The hustling yard crew of 20 men is superintended by Gene Dahlheimer. William W. Tucker is plant manager and executive vice president. The chief engineer is Lawrence A. Lee. Emil Fehr is president of the vigorous young company.

THE END

← For more facts, use Request Card and circle No. 291

The Brandenburg Gate, where West Berlin ends and East Berlin begins. Through the gate is "Unter den Linden," the former German capital's principal thoroughfare. The large building on the communist side houses the U. S. S. R. embassy to East Germany. Since August 13, when the Communists sealed the sector border, a barbed-wire barrier has been strung in front of this monument along the line of the sign that reads, "Attention! You are now leaving West Berlin."

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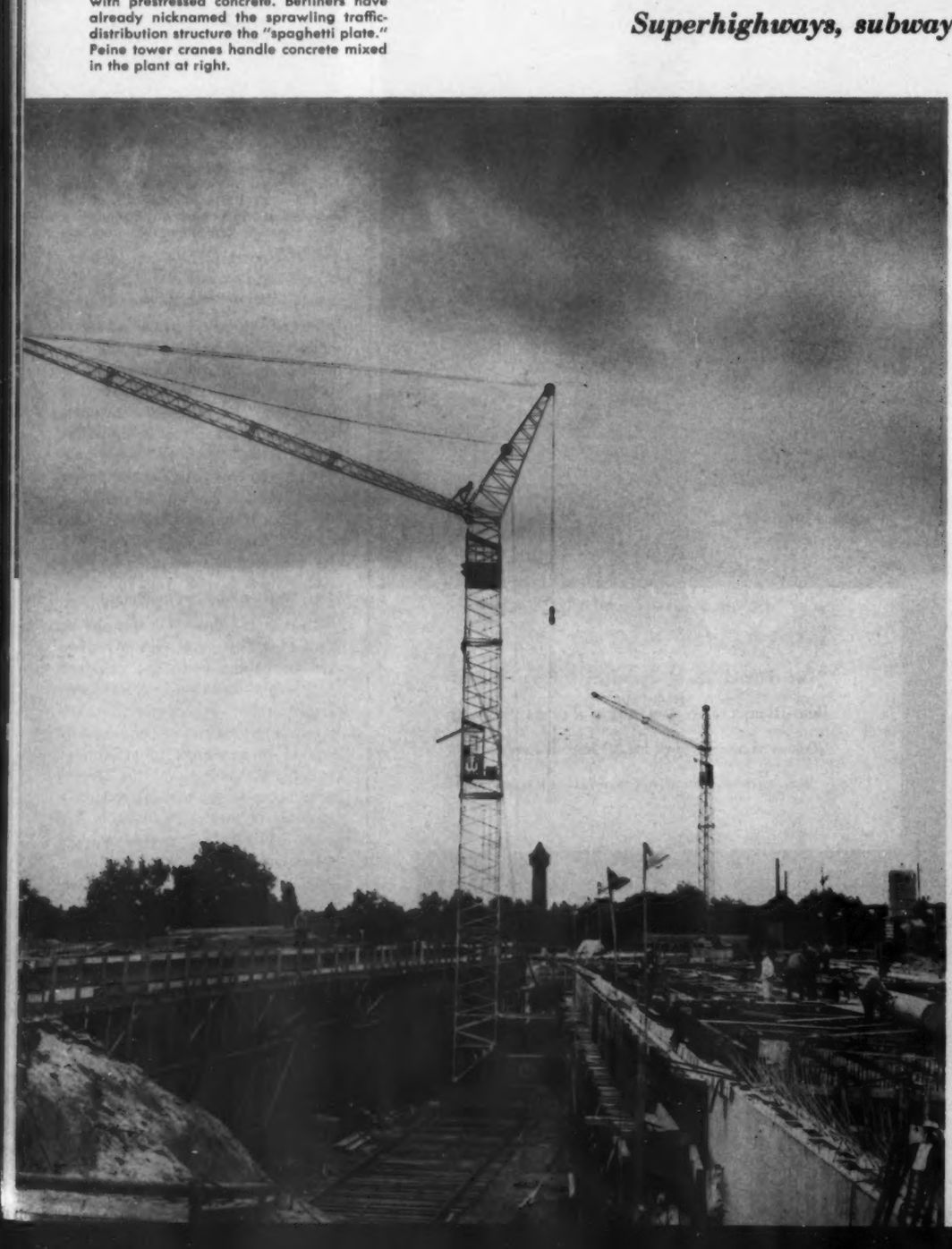
BERLIN BUILDS:

Superhighways, subways, and apartment houses

by WILLIAM H. QUIRK, editor

Construction in progress at the Avusverteiler—a complicated interchange where the autobahnen or superhighways entering Berlin connect with the city's urban motorway. Traffic will be carried at three different levels over 11 separate bridges built with prestressed concrete. Berliners have already nicknamed the sprawling traffic-distribution structure the "spaghetti plate." Peine tower cranes handle concrete mixed in the plant at right.



The northbound urban motorway will squeeze through this open cut following the alignment of the electric railway. The bridge abutment in the rear will be set back to the line of sheet-pile retaining wall. The 12-meter-high (39.4-foot) wall supports the marginal road at street level.

Steel cylindrical piles, 1 meter in diameter (39.37 inches) and from 10 to 12 meters long (32.8 to 39.4 feet), are driven in line 8 to 10 meters (26.2 to 32.8 feet) on centers, as part of underpinning support for a row of apartment houses.

A close-up of the pile-hammer head atop the steel drilling tube. As the weighted head turns horizontally under air pressure, the hollow shell is driven into the ground. As the pile is sunk, dirt is excavated from within the shell by a bucket hung from the crane boom. After the pile is driven to required depth, the cylinder is filled with concrete. Then the steel tube is withdrawn.

Only time will tell what will happen to West Berlin. But even as Soviet pressure is isolating this Western outpost more and more Berliners still continue their comprehensive construction program. Though located 110 miles deep in communist East Germany, West Berlin is building at a busy pace, particularly with highway, subway, and apartment-house construction.

As Rolf Schwedler, West Berlin's Senator for Building and Housing, put it: "Our achievements in the field of construction constitute a proof of the confidence and the efficiency of the Berliners. For the Germans in the Soviet-occupied zone, the building up of the capital represents a proof that they have not been forgotten and that we belong together."

Senator Schwedler, a 47-year-old graduate engineer, heads the West Berlin ministry that is responsible for the planning of public works, awarding of contracts, and supervision of construction. His office also must approve architectural plans for private building. All construction in West Berlin is handled by private contractors.

Most of the public-work jobs are being done by 15 different contracting firms, which are also active on projects in West Germany. Several of the West Berlin contracts are joint ventures, with three or four contractors participating. One company is in immediate charge of the work. All contractors are concerned with keeping their labor forces continually employed so that they will not lose personnel to West German projects.

Emphasis on housing

The confidence in Berlin's future, expressed by Senator Schwedler, is backed up by a current construction budget of 1.3 billion Deutschmarks (about $325 million). Close to half of this, $150 million, is being expended in housing—new apartment buildings or alterations to existing structures. The remainder is allocated chiefly to the transportation needs of the city—for new highway and subway construction.

Housing construction spurted right after the first Soviet land blockade was lifted in 1949. Since then 200,000 new apartments have been built in West Berlin, with some 30,000 apartments now under construction. These are scheduled for completion either this year or early in 1962. Most of the larger current

(*Continued on next page*)

Constructing an approach pavement to an elevated section of the urban motorway. Here, the first course of bituminous gravel is being compacted by a 3-wheel steel roller, together with a 6 and 4-wheel rubber-tire roller. The area around the catch basin is being tamped with a Wacker 50-kilogram (110-pound) vibratory compactor.

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Despite international tension

BERLIN BUILDS:

Superhighways, subways, and apartment houses

by WILLIAM H. QUIRK, editor

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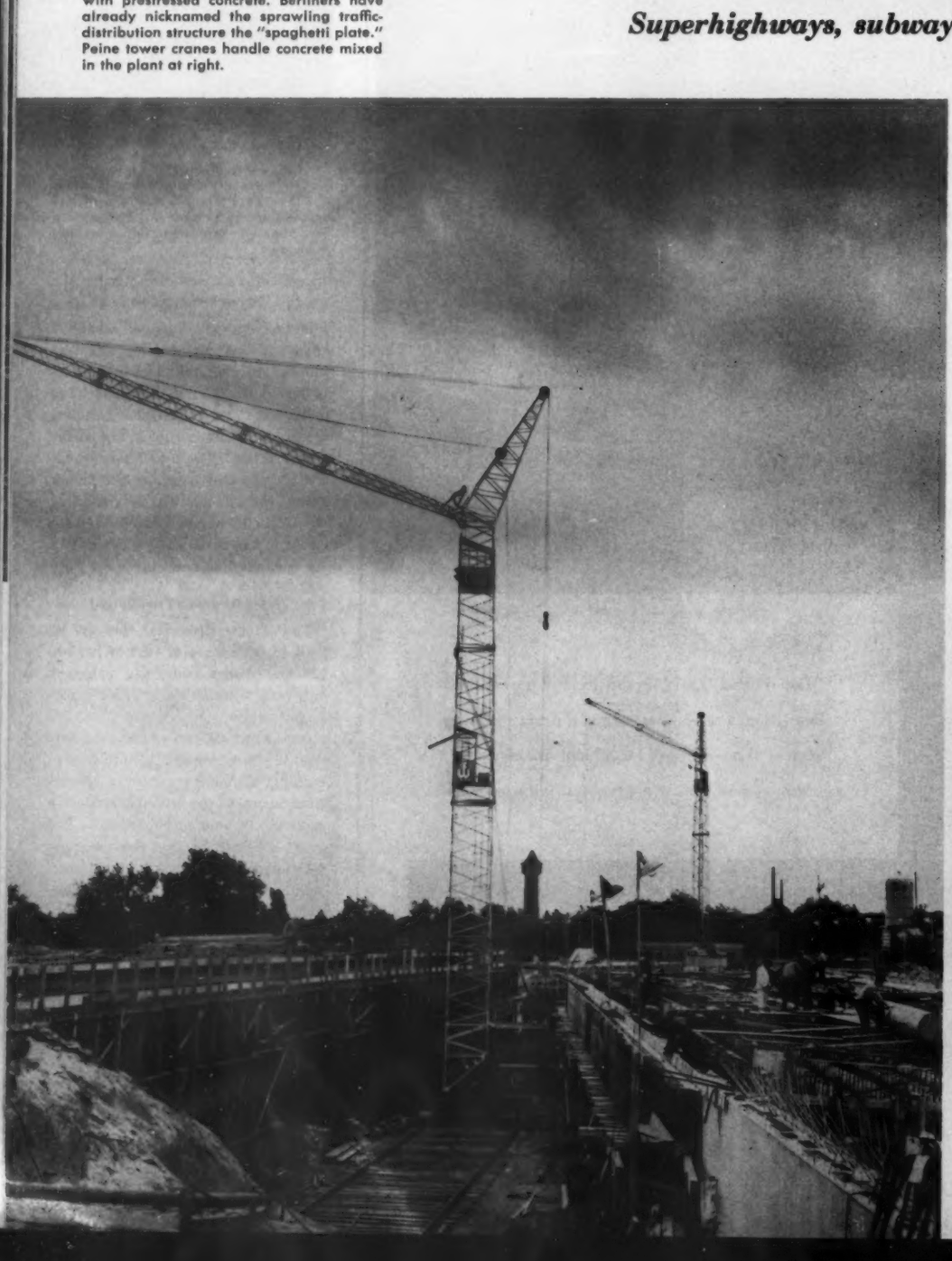

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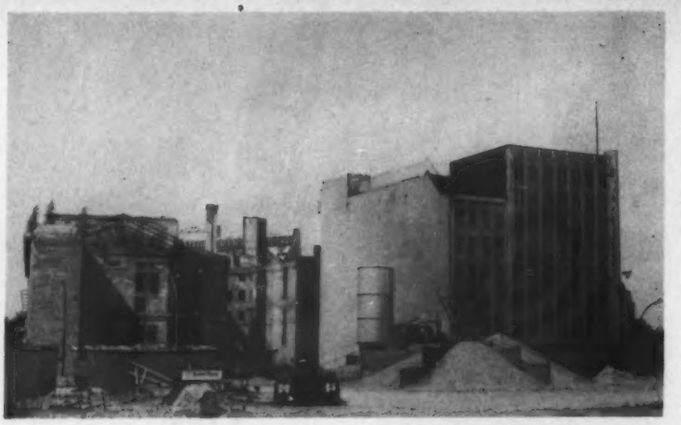


Site is readied for construction of a new building in West Berlin, with batch and concrete mixing plant already set up. Bombed-out Hotel Eden, left, has remained that way since the war. The new building at right houses a travel agency.

housing projects are located in the southern and sparsely settled portion of the city.

While Berlin never had a real slum problem, many of the older tenement houses were built in the midst of industrial districts. Under an urban redevelopment program, housing is now being separated both from industrial and commercial building. This results in many resettlement problems, since the city endeavors to destroy as few homes as possible during its big construction program.

Placed around the city where they can be easily seen are glass cases containing models of these new developments. Buildings painted white are still in the planning stage; brown color indicates completed structures; gray-painted buildings signify those that will remain under the new plan. Thus the administration lets its citizens know just what they can expect. The populace, in turn, shows a greater interest when it is kept informed of the city's plans.

Commercial buildings are now pushing upwards because of the rising cost of real estate. The city administration has set a limit of 25 stories for the height of such "skyscrapers." Tallest in Berlin is the 22-story 80-meter-high (262-foot) Telefunken or "House of Electricity" building, located at Ernst Reuter Platz.

New Berlin subway

Late in August, a 4½-mile north-south extension was added to the subway system in West Berlin. This connects the northern industrial section with the heart of the downtown business district. Previously, if one wanted to travel between those two areas by rapid transit, he would have to take the U-Bahn that passed through East Berlin. Two other lines are now under construction, extending existing subways to serve new housing areas in the southern part of the city. The subway network now totals 60 miles in length. To relieve street and highway traffic, and to cross-connect the inner-city area, the city plans to expand the subway system to 200 kilometers (124 miles).

One such proposed extension will serve the Charlottenburg residential area in the western part of the city. This line is not scheduled to be completed before 1972, but already a strip of right-of-way has been allocated for subway construction. To make certain that no other work will impinge on this piece of land, rows of trees have been planted along the right-of-way.

Heavy highway traffic

Highway traffic is heavy in this busy metropolis. Berlin is a big city with a total area of 341 square miles, only 18 square miles less than that of New York City. Of this total, 186 square miles comprises West Berlin and 155 square miles is in East Berlin. Before the current crisis, the population of Greater Berlin was approximately 3½ million, with some 2¼ million in West Berlin and about 1¼ million in the East or Soviet sector. While only one in ten West Berliners now owns a car, as compared with one in three in the U.S.A., traffic density in the German city is about as high as it is in this country. Consequently, the city is expanding its highway network on the basis of a 1:5 motorization index figure.

Key project in this expansion is the inner-ring or inner-city freeway system for fast traffic, with controlled access and no grade crossings. Started in 1956, it comprises 100 kilometers (62 miles) of superhighways, of which 37 miles are tangential roads and 25 miles are an urban motorway. The inner ring is scheduled for completion next year. It will be one of the finest

urban highways in Europe, having six lanes of traffic—three in each direction, separated by a 6½-foot dividing mall. Each lane is 3.5 meters (11.5 feet) wide.

Construction costs on this inner freeway are high, averaging $5 million to $6 million per mile. This is considerably higher than the cost of autobahn construction out in the country, where entrances and exits are spaced about 30 kilometers (19 miles) apart. On the urban motorway, access and exit roads are closer, coming every 1.5 kilometers (1 mile). Naturally, too, the city section has many more grade-separation structures than does the country.

Largest job now under way on the inner ring is the Avusverteiler, a sprawling traffic-distribution structure comprising eleven bridges that will carry cars at three different levels. From the way it appears in a scale model and as it is taking shape, Berliners have nicknamed the complicated interchange the "spaghetti plate." It is located on the western perimeter of the inner ring at a point where the autobahnen, or superhighways, that enter Berlin connect with the urban motorway.

Two of these autobahnen meet at a point about 30 kilometers (19 miles) southwest of the city and funnel supplies from West Germany into West Berlin. The autobahn from Hanover-Helmstedt carries 67 per cent of all truck traffic into the city, while the other, originating from Munich to the south, carries 19 per cent. Thus 86 per cent of all truck traffic entering West Berlin will eventually be diffused throughout the city at the Avus structure. The word Avus comes from an auto race track of the same name, also located close by the junction point. Here also are the Berlin exhibition grounds and the radio tower.

North of the structure, a 10-kilometer (6-mile) stretch of motorway is being extended, starting with a cut section that also carries the line of an electric railway. The railway was built in 1890 to serve industrial plants in the northern part of the city, so it was decided to follow this alignment with the motorway. The cut is being widened, which involves setting back abutments on each bridge that now carries traffic over the railway. Since apartment houses are too valuable to be sacrificed for the urban highway, a high retaining wall is being built along the outside edge of the bordering street. The latter will be a marginal road to the freeway.

Pile driving

The motorway will run between the railway tracks on one side and a 12-meter-high (39.4-foot) sheet-pile retaining wall on the other. Before the sheeting could be driven, however, the row of apartment houses overlooking the cut had to be underpinned, in some locations to a depth of 20 meters (65.6 feet). One contractor, Grun & Dilfinger, gave the dwellings the necessary support by driving

(*Continued on next page*)

The fire-blackened 262-foot stone steeple of the Kaiser Wilhelm Memorial church, destroyed in the war, is left as a symbol in West Berlin. Flanking it are the new octagon-shaped Evangelical church and its slender companile. The two ultra-modern structures are built of steel, concrete, and glass.

(Continued from preceding page)

This nearly completed 8-story apartment house in the Hansa section is a gift of the United States. It will provide quarters for 326 students of Berlin Technical University, located nearby.

steel cylindrical piles, 1-meter-diameter (39.37-inch), in a row next to the apartments on 8 to 10-meter (26.2 to 32.8-foot) centers. As the pile shells were driven they were excavated, and the tubes were filled with concrete. Then the piles were withdrawn for further use. Average depth of piles ranged between 10 and 12 meters (32.8 and 39.4 feet). Concrete beams from the piles to the footings of the apartments gave the needed support.

Driving of the ⅛-inch-wall high-strength steel shells was done with a hammer-head type of pile driver that cut the steel tube into the sandy soil like some gigantic cookie cutter. Heavily weighted at the ends, the driver fits over the top of the cylindrical pile and revolves back and forth horizontally from 45 to 90 degrees on a ring of ball bearings. The swinging movement is actuated by compressed air moving through pressure cylinders located in each arm of the hammer head. The reverse movement of the driving mechanism is controlled by a cam at the head. Each twist sends the shell into the ground about ½ inch. Driving is obtained then as a result of the great weight in the head, the cutting by rotation, and the vibratory action.

Continuous with the sinking of the pile is the excavation within the steel shell. This is handled by a special bucket that is hung from the boom of a crawler crane, and that fits inside the pile. The bottom and sides of the bucket retract to take a bite of dirt and then, once clear of the pile, unhinge to drop the load. The driving is not interrupted by the excavating.

After the shell reaches the required depth and all dirt is removed from within, concrete is placed within the pile. The top is then capped airtight,

Rolf Schwedler, Senator for Building and Housing in West Berlin.

and compressed air is admitted through an inlet valve in the cap. High air pressure forces the concrete down in the tube, as the steel shell is withdrawn by the same rotating action of the hammer-head pile driver. After the shell is extracted, it is available for re-use. In locations where ground water is encountered, a sand pump is used to excavate within the pile where the bucket might not be practical.

Both rigid and flexible types of pavements are being laid in Berlin. In either case, the base course consists of a 15¾-inch layer of compacted gravel. This may support a 9-inch reinforced-concrete slab having transverse joints on 26-foot 3-inch centers. Or it may serve to support three 2½-inch courses of bituminous gravel binder, on which is laid 1¼ inches of bituminous concrete. In either case, the total thickness of base and pavement is 24 inches or more.

With the flexible-type pavement, compaction of the various courses is achieved with both steel-wheel and rubber-tire rollers. Areas around curbs, manholes, and catch basins are tamped with vibratory compactors. On the freeway, the maximum grade of finished pavement is 3 per cent, while on the access and exit ramps the maximum is held to 4 per cent.

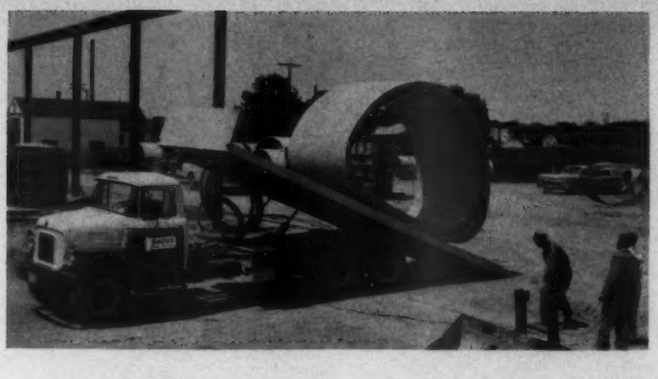
THE END

Heavy prestress members are loaded with ease

■ The Hancock Concrete Products Co., Hancock, Minn., solved one of its most difficult transportation problems with a new Schwartz heavy-duty ramp hoist. Prior to the purchase of this new equipment, the Hancock firm had considerable difficulties in transporting large precast-concrete units. With this new transport equipment, one man can load and unload units weighing many tons.

When products or equipment are to be loaded, the platform of the Schwartz ramp hoist is raised hydraulically. The cable from the hydraulically operated winch is attached to the unit to be hauled and pulls it into position on the platform. The platform is then lowered and automatically locked, and the load is ready to move at highway speeds. For the unloading process, the procedure is reversed.

The entire operation is controlled by means of a push-button control system on an extension cord so that the operator has full view of the operations at all times.



Big precast members such as this culvert are easily loaded by means of the Schwartz ramp hoist. One operator handles loading and unloading by remote control.

Maryland plans ahead for winter road care

■ For the past two months the State Roads Commission of Maryland has been getting ready for winter. Last year, snow-removal operations on the 4,705-mile state highway network cost a record $2.3 million, and the commission hopes that careful preseason planning will lower this amount for 1961–1962.

In preparation for the snow season, the commission has ordered 14 graders equipped with V-plows, more front-end loaders, and new snow fence. Bids on salt, chemicals, and abrasive materials have already been taken.

For the first time, the state is setting up a system of emergency snow routes, and vehicles traveling them are required by a new state law to be equipped with snow tires or chains. Most of these routes will be principal highways, and all will be posted with special signs.

U. S. Steel releases new film on welding

■ United States Steel Corp. has produced a 16-mm color and sound motion picture designed for showing to shop and field welding crews, welding trainees, and vocational and engineering school students.

The 18-minute film, "How to Weld T-1 Steel," illustrates step by step the way to obtain sound welds in structures and equipment fabricated from this material. Viewers are given a booklet with the same title, and a welding heat-input calculator, the use of which is demonstrated in both the film and booklet.

Arrangements for group showings of the film can be made by writing to United States Steel Corp., Room 6363, 525 William Penn Place, Pittsburgh 30, Pa.

Fairchild Aerial Surveys, Inc.

A stretch of the Jersey Meadows in the Hackensack area, between New York to the east and Route 17, N. J., the main highway at the bottom of the photo, forms part of the 30,000 acres that are expected to be reclaimed for industrial use within the next 20 years. Advances in soil mechanics and foundation and hydraulic engineering are making the development possible; a regional planning agency will aid local governments in the work.

The Jersey Meadows—reclamation of a wasteland

by DON TAYLOR, field editor

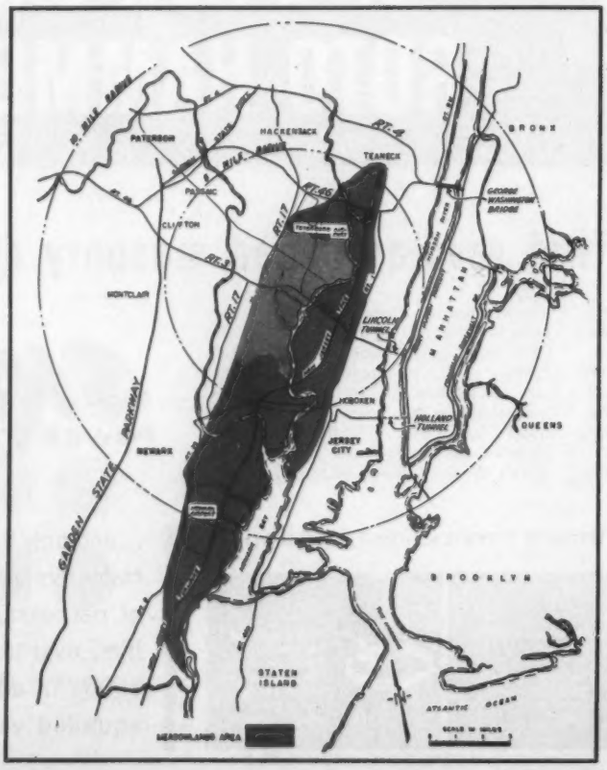
The New Jersey Meadows, a huge tract of relatively undeveloped and forbidding waste land in the heart of the world's largest metropolitan area, is giving way to the forces of economics and development to become one of the most valuable pieces of industrial real estate anywhere in the world.

The economically feasible development of these heretofore undesirable lands is made possible through the application of soil mechanics in foundation engineering, hydraulic engineering in reclamation plans, and regional planning in sound, practical, and foresighted development plans.

No clear boundary

The extent of the meadowlands is not clearly defined by any boundary, but generally it is considered as a 16-mile stretch of land from Englewood, N. J., on the north to Elizabeth on the south. It covers approximately 30,000 acres, the surface of which is within 2 or 3 feet of mean sea level. Most of it is subjected to tidal forces, and, except where building has encroached on its boundary, it is characterized by a dense growth of swamp reeds and cattails. It is divided by utility lines, transportation routes, and natural and man-made drainage channels.

Except for a few rock outcroppings, the subsoil is generally a combination of glacial lake deposits of sand, silt, and clay deposits overlaid with a soft organic mud that supports the growth of the meadow grasses. These poor



This map outlines the general location of meadowlands that may be one of the most valuable pieces of industrial real estate in the world because of its proximity to New York City and the small amount of land area available in the metropolitan district. Roads, rail lines, a few industrial sites, airports, and marine facilities comprise the major construction on the meadows at the present time.

foundation conditions, although not insurmountable, make building-site preparation expensive and, until recently, prohibitive. Almost all of the meadowland, however, is within sight of the New York City skyline and is easily accessible to this city on the east and to the fast-growing areas of north Jersey on the west. The location advantage, plus the fact that there are few other industrial sites remaining in the area, makes the meadows a desirable area that now competes cost-wise for industrial construction.

The meadowland is divided by several political boundaries and several drainage basins. Some political entities can handle most of their own development problems—as Elizabeth and Newark are doing—but where drainage affects more than one community, the problems involved in efficient economic development are too large for each municipality or even county to handle. In the Hackensack River basin, the Meadowlands Regional Planning Agency, established by the state of New Jersey, is helping to assist the local governments in the planning and development of its meadowland resources. No matter who handles the planning problems, however, the importance of coordinated highway and other transportation programs, utility expansions, maritime facilities, and drainage control cannot be disregarded if maximum returns are to be obtained from the development of the Jersey Meadows.

Development to date

Development has proceeded on and along the meadows despite high site-preparation costs and is continuing to do so steadily. It has been estimated by local planners that, whether or not the development is planned or regulated, the meadows will be fully developed within 20 years.

The 12,000 to 13,000 acres of meadowland outside of the Hackensack basin are well over 50 per cent developed already and include The Port of New York Authority facilities of Newark Airport, Port Newark, and Port Elizabeth. The Port Authority, building these large projects, has been able to devote energy to research and development work on meadowland construction methods, and this has been useful for its own purposes and for those of smaller private and public jurisdictions. In the Hackensack Meadows, about 2,000 acres are in use; this represents 10 to 15 per cent of the total number of acres available.

Although foundation and local drainage problems are similar throughout the entire Jersey Meadows, the Hackensack Meadows is the most complicated because of its intermunicipal and intercounty implication of government, financing, land use, and river control. The meadowlands do not recognize political boundaries in these categories. To cope with these problems on an intermunicipal basis, the state of New Jersey established the Meadowlands Regional Planning Agency to help

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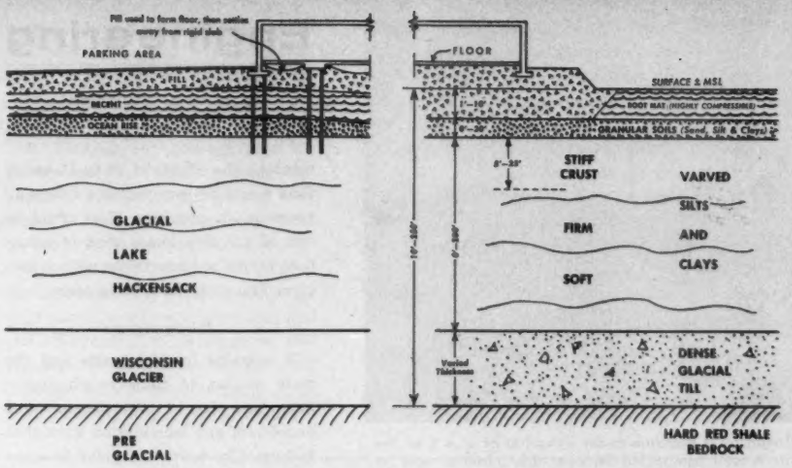


Cross sections show two methods of building over a typical meadow. In both cases, the compressible root mat must be removed or bridged; it is not relied on to carry building loads. Very high loads have to be carried to bedrock.

MEADOWLAND SOIL PROFILE AND CONSTRUCTION METHODS

Surcharge and debris are removed by a dragline to an elevation of plus 6 at the Sexton plant, now being built. A well compacted fill over this material will be carried to an elevation of plus 8.5 to support a 6-inch floor slab.

(Continued from preceding page)

combine the efforts of 10 to 15 towns that would be involved in an over-all reclamation program. This could be one of the first times that reclamation would be undertaken with municipal financing on a large scale.

Joint program

It remains for the towns and the state agency to come to an agreement on a plan to share the economic benefits of any reclamation work that is done. The towns will have to allow the agency to operate as a single entity to reclaim, develop, and build facilities, and handle the financing of such efforts. The towns would collect taxes in their areas but pay to the agency amounts representing benefits received as a result of reclamation. The agency would reimburse the towns for costs of services provided the meadow area, plus surplus revenues in proportion to the land the town has in the meadows as against the total meadowland involved. On the other hand, the overall plans of the agency would require municipal approval from the towns involved, and operations would be subject to their scrutiny.

The physical needs of a joint reclamation program are, basically, protection from high river and ground water due to tides and storms, and adequate drainage from inland areas to the river. The mean high-water level is about plus 2.6, and the elevation of the meadows itself varies between sea level and plus 3.0 feet. Mean low sea level is about minus 2.0 feet, and the highest recorded water level in the river in the recent past was plus 7.9 feet. There is, however, the possibility of having a higher river level if the combinations of rainfall runoff, surge height, and high tide occur at the same time.

Without reclamation, it would still be possible to maintain reasonably water-free buildings if floors were set at plus 9.0 elevation or higher. To provide this amount of fill for all building sites in the meadow would require a sizable amount of earth and money. With reclamation methods, and a system of dams, dikes, and pumping station, it would be possible to maintain water levels of possibly minus 2.0 elevation and place floors of buildings at plus 5 or plus 6 elevation. Roads could be set at minimum elevations of plus 3 instead of plus 6. In this way, savings of more than one-half of the fill necessary for structure and other foundations could be made. Some figures indicate that these savings could amount to $10,000 or more of site-preparation costs per acre of meadowland reclaimed.

Proposed reclamation work

A study made by NEDECO (Netherland Engineering Consultants) for a private-interest group on the feasibility of reclaiming 15,000 acres of the Hackensack Meadows weighed various combinations of dikes, dams, and pumping stations, construction-fill levels, water levels, and navigation requirements to successfully and economically reclaim the Hackensack Meadows. Based on information available to the consultants in 1959, their most favorable solution to the problem was as follows: (1) the river should be closed by a dam approximately 16 feet high at some point near the mouth of the Hackensack River, thus affording protection against high tides; (2) a drainage sluice and navigation lock would be

provided through the dam; (3) flood plains and low dikes would be provided for storage of heavy runoff during high sea-water periods; and (4) the area would be divided into a number of drainage units, each drained separately by pumping into the river. For safety, and because of the high value of the reclaimed land, they recommended that the river be closed before work proceeded with the development of the drainage units. The total cost was in the order of $65 million for reclamation works.

Some authorities disagree with the Netherlands firm, and claim that reclamation can proceed on a basis of development by individual drainage units until the combined tax revenues of the municipalities involved are such that they will support major programs running into several millions of dollars. Still, it is generally agreed that a controlling agency will be necessary to operate a sinking fund to provide for future works and to coordinate the construction of separate drainage units to fit into any over-all plan for the area. Since a major engineering feat of $65 million will take 5 to 10 years to execute under present progress, and full development is expected within 20 years, it looks as if reclamation will have to proceed on this piecemeal basis.

Foundation design methods

Actual building on the meadows is not a mysterious problem. Adequate foundations of several types have been used, and better methods are being devised. There are, however, many pitfalls of design and construction that can be circumvented through thorough soils investigation and application of the principle of soil mechanics. Inadequate investigation or unskilled use of these principles have resulted in failure through cracked foundations or intolerable settlements in floors or footings. Garbage dumps and fills over meadow mat can be very dangerous for building unless provided for in the footing and floor design.

A popular notion that good foundation in the meadows must be founded on bedrock with piles is far from being true. If it were, the cost of developing the meadows would surely be prohibitive. The light industrial plants and 2-story buildings of factories, offices, or warehouses needed by industry in the New York metropolitan area do not warrant the use of such methods. Instead, they are founded in compacted earth fill placed over the relatively stiff sands and clays that underlie the ooze and mud of the overlying root mat, after the surface mud and root mat are excavated.

Soil borings throughout the meadows generally reveal similar information on soils and geology. From 1 to 10 feet from the surface there is a highly compressible root mat. This material is not used for bearing and is generally removed. Beneath the root mat can usually be found a layer of granular material or a stiff clay of underwater origin from 0 to 20 feet thick with good bearing ability. Under this is a deep layer of varved silts and clays, deposited when the land was under a huge glacial lake. Yearly thaws deposited the varves, alternately in layers of sands, silts and clays to depths up to 200 feet. Between the bedrock and the varved material occur irregular deposits of glacial till left by the Wisconsin Glacier. Red shale forms most of the underlying bedrock.

Samples from the borings are generally taken with a 2-inch-diameter split-spoon sampler, and additional soil information is gathered by obtaining 24-inch-long undisturbed samples with 3-inch-diameter thin-walled Shelby tubes. The undisturbed samples submitted to consolidation tests indicate that the soils have been subjected to natural preloadings in the past and also indicate how effective surcharging can be in reducing building settlement, if such treatment is necessary. Frequently building loads or soils are such that deliberate surcharging is not necessary. Other tests made by the soils engineer are triaxial tests, unconfined compression tests, gradation tests, and plastic and liquid limit tests. A study of the results of these tests tells the soils engineer what bearing loads he dares allow and what settlement he can expect initially—and eventually—in the fills or in the structures.

Several techniques are used to found buildings on the meadow without driving piles to bedrock. The safest and often the least expensive is to remove the meadow mat completely and replace it with well compacted fill. Placement of such fill has to be carefully supervised by a soils engineer to obtain optimum compaction throughout. Soft spots are removed when they appear and are recompacted or replaced with new material. One guide specification calls for 92 per cent compaction of Modified AASHO maximum dry density, and a moisture content within plus or

A utility line is being placed directly in the well compacted fill at the Sexton plant in the Englewood, N. J., area of the meadows. The fill provides adequate support for utilities as well as footings and floors.

(Continued from preceding page)

minus 2 per cent of optimum as defined in the Modified AASHO Compaction Test.

Surcharging is sometimes necessary to preload the underlying clay beds. In some cases the surcharging produces fast results, since the horizontal varves provide quick exits for water squeezed out under the surcharge. Footings can be founded within these fills, as can utility lines and floors. Pressures due to building loads are so spread by the fill that the underlying clay is loaded only slightly. Excellent results have been so obtained.

Another possible method is to drive piles into the stiff upper layer of varved clay and support both the footings and the floors on them. Fill placed over the root mat is used as a base to pour the floor slabs, but due to expected settlement of the root mat, the fill is not relied on to carry loads. This method would be used when the root mat is excessively deep or overlaid by garbage and removal or displacement would be difficult. It would also be used when large fills are found already in place prior to the soils investigation of the site.

Some construction practices also help keep costs down. Dewatering of the site with drainage ditches and sumps shrinks the root mat appreciably. Root-mat dikes around the site also help keep out tide water and other local drainage. If root mat is further stored in windrows after excavation, it will drain and lose more of its volume and weight. It can then be removed with less trouble, or it can be used to fill outlying areas on the site. A first layer of rock fill on the wet sands or clays under the root mat helps to provide a workable footing to get the fill operation started.

Two meadowland jobs

A typical example of meadowland construction is the new parcel-post distribution center in Kearny, N. J., that is being built by the Post Office Department. The 30-acre site, convenient to rail and highway routes, was chosen because of its access to the New York-New Jersey metropolitan area. Site preparations are presently being made under the direction of Woodward, Clyde, Sherard & Associates, soil and foundation engineering experts, after a very careful soil investigation for the area was conducted by the same firm. They found that root mat averaged 6.8 feet deep, silty medium to fine sand was 8 to 24 feet thick, varved clays 50 to 80 feet thick, glacial till was about 5 feet thick, and red-shale bedrock was 77 to 108 feet below the surface.

The root mat was dewatered and removed, and gravel and rock were hauled in as fill. Building loads were designated as 4,000 pounds per square foot allowable for spread footings; 3,000 pounds per square foot allowable for strip footings; and 250 pounds per square foot for floor loads. The building, planned to cover 15 acres, will be 25 feet high, 500 feet wide, and 1,000 feet long, and it was estimated that it would impose at maximum an average load of 320 pounds per square foot on the foundation materials. Computations for foundation design indicated that an average building load of 1,000 pounds per square foot might have been permissible at this site without the occurrence of detrimental settlements.

In Englewood, N. J., John Sexton & Co., institutional manufacturing food distributors, was willing to pay a premium for foundation prepara-

tion in order to obtain advantages of location and access not otherwise available. In this case, a somewhat different approach was used to provide adequate foundations for the $2 million industrial development. At this site, the soil engineer, Joseph S. Ward, Inc., of Caldwell, N. J., found that the area was filled to elevation 15 with 13 feet of miscellaneous debris that had been in place for about 50 years. Meadow mat was almost nonexistent under the fill, having either been displaced or removed to accommodate the fill. Under the debris was a sand or stiff clay layer 10 feet thick, followed by approximately 80 feet of varved clay that turned into a noncompressible silt near the bottom of the layer. Glacial till of varying thickness was between the silt and bedrock. The area, which will house 66,000 square feet of warehouse, 36,000 square feet of processing area, and 12,000 square feet of office space, was surcharged to elevation plus 23.0 for one month for office areas and for four months for processing and warehouse areas to precompress the underlying clays. The surcharge was removed and the debris excavated to elevation plus 6.0. A carefully controlled, well compacted fill was then placed to elevation plus 8.5 to support a 6-inch floor slab. Eight hundred pounds per square foot was used as a design figure for total loads over the floor of the factory and warehouse.

Spread footings at the Sexton site were set at elevation plus 2.0, and a loading of 2,000 pounds per square foot was allowed if the footing rested on at least 3 feet of natural or compacted sand. If the contractor chose not to place compacted sand, he would have had to increase the footing size to obtain a maximum bearing load of 1,000 pounds per square foot. In this case, the contractor chose to use the sand base.

That the meadowlands can be developed and built upon can no longer be disputed, nor can it be disputed that it will develop fast in the next few decades. What remains to be done is to provide for development that insures a maximum return on effort through proper engineering, planning, and financing so that the area does not become a haphazard growth in unrelated, unregulated, and separate parcels of land. THE END

Beaver-Advance releases new film on scaffolding

■ Basic scaffolding setup as used in all kinds of construction and maintenance work across the nation is shown in a 20-minute sound and color motion picture titled "More Profits for Builders," released by Beaver-Advance Corp., Ellwood City, Pa. The 16-mm movie demonstrates many unusual scaffolding applications on industrial buildings, aircraft hangars, churches, bridges, reservoirs, etc.

The film will be loaned free of charge upon request to Thos. J. Barbre Productions, Library Division, 2130 S. Bellaire St., Denver 22, Colo.

PITTSBURGH'S MULTIPURPOSE Public Auditorium, featuring a retractable stainless-steel roof that can be closed in 2½ minutes, stands ready for business. It can accommodate up to 13,600 spectators. The interior of the steel and concrete structure has walls and partitions faced with Vitritile units for easy maintenance.

Distributor Doings

For more facts on insert, use Request Card and circle No. 305

Allis-Chalmers names

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has appointed Berry Equipment Co., Beach St. and Belknap, Fort Worth, dealer in 12 Texas counties for its utility wheel and compact crawler tractors and for a complete line of earthmoving and material-handling equipment.

Harnischfeger appoints

Constructors Equipment Co., Inc., of Denver, Colo., has been appointed dealer for P&H construction and mining equipment manufactured by Harnischfeger Corp., Milwaukee, Wis., in the state of Colorado. It will handle the complete line of P&H crawler and rubber-tire power cranes and shovels, and soil stabilizers.

Furlow buys two branches of Louisiana company

Alvin Furlow has bought the Baton Rouge and New Orleans branches of Southern Equipment & Tractor Co. and will operate them as Furlow-Laughlin Equipment, Inc. Furlow formerly was a principal in the parent company. The purchase was made from Charles Brown of Monroe, La., who will remain in the equipment business in northern Louisiana.

There are no changes in personnel, location, or lines of equipment handled. These include Allis-Chalmers, Schield Bantam, Koehring, Jaeger, and Wayne.

Clark names dealers

Western Frontier Machinery Co., 820 N. 17th Ave., Phoenix, has been appointed distributor in Arizona for the Michigan line of construction machinery made by Clark Equipment Co., Benton Harbor, Mich.

Western States Machinery Co., 2400 W. 7th Ave., Denver, has been appointed distributor of the Michigan line for the state of Colorado. The line will be handled in northwestern Idaho and eastern Washington by Rowand Machinery Co., N. 808 Division St., Spokane.

Yale & Towne names Texas distributors

The Trojan Division of Yale & Towne Mfg. Co., Batavia, N. Y., has appointed two new distributors for its Trojan tractor-shovel line in Texas.

Roy Klossner Co., Inc., 727 North W.W. White Road, San Antonio, will handle south central Texas. Southeastern Texas will be covered by South Texas Equipment Co., 5500 Navigation Blvd., Houston.

Barber-Greene appoints

Western Machinery Co., Inc., 3818 S. Treadaway, Abilene, Texas, has been appointed a distributor in west central Texas for all lines of equipment made by Barber-Greene Co., Aurora, Ill. The new dealer will sell and service B-G asphalt plants and finishers, road wideners, ditchers, belt conveyors, hopper-car unloaders, portable screening plants, and other construction machinery.

H. O. Penn Machinery names engine manager

William Bedell Morrison has been named manager of the Engine Division of the H. O. Penn Machinery Co., New York City, replacing Horace G. Ruggles, who is retiring. An engine salesman for the firm since 1945, he has wide experience with all types of Caterpillar diesel applications for industrial power, electrical standby, emergency, and all types of marine installations.

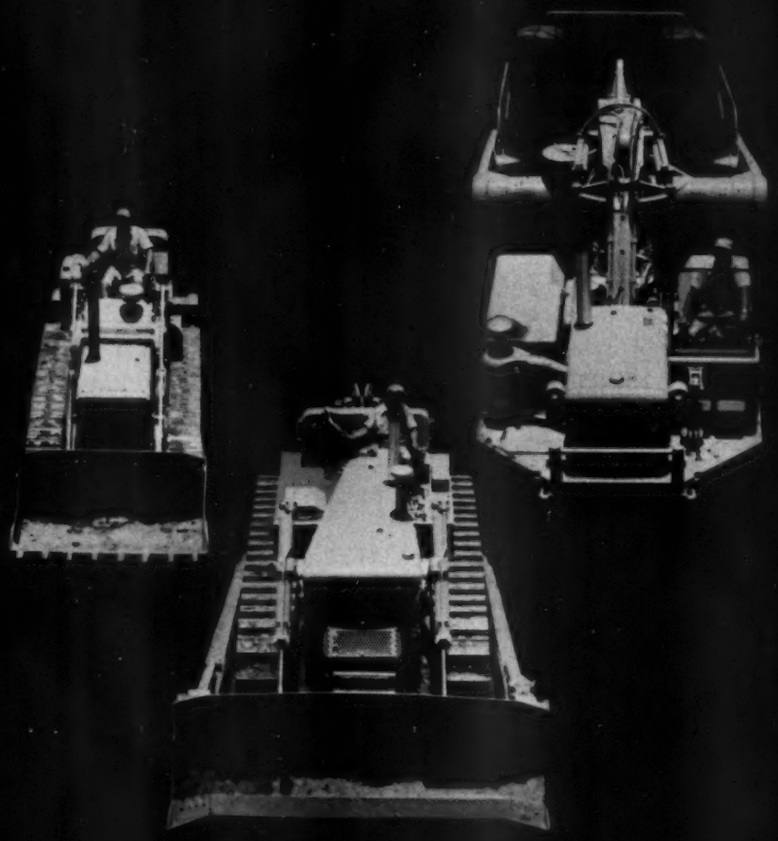
Specialty supply firm acquired by Eastern

The Eastern Co., Naugatuck, Conn., has acquired Thompson Materials Corp., specialty supply house of Belleville, N. J. The new subsidiary will be the principal marketing outlet for uniform transverse contraction joints made by Eastern's Frazer & Jones Division, Syracuse, N. Y.

Thompson will distribute throughout the Northeast under the name of Chaffee Materials Corp.

Kwik-Mix dealers

Kwik-Mix Co., Port Washington, Wis., a division of Koehring Co., has appointed Gil Boers Equipment Co., 7625 S. Kedzie Ave., Chicago, Ill., and Equipment Repair & Supply Co., 51 E. Lake St. Northlake, Ill., distributors for north central Illinois and adjoining Indiana counties.



CATERPILLAR REPORTS

On the following pages:

Why three different Cat power shifts?

How loader power shift cuts cycle time . . .

Production test—D8 PS vs. D8 DD

"Hit the floorboard and let 'er roll"

How rugged is Cat power shift?

Why you get more production from a Cat power shift:

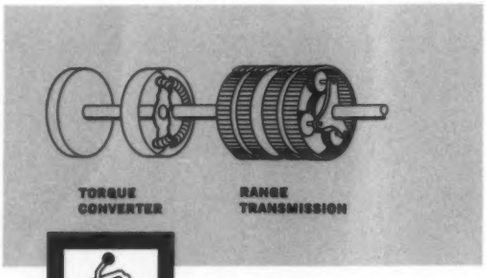
THREE DIFFERENT

THREE DIFFERENT

Any workable power shift transmission has great advantages over direct drive. By doing much of the operator's routine physical work for him, it reduces fatigue, lets him work faster and more productively.

So, if power shift is good, why not pick one proven type of power shift transmission and use it on all types of machines? Many earthmoving manufacturers do just this and come up with good results.

Unfortunately, "good" isn't necessarily "best." No one general purpose power shift transmission can get the *best* production out of every type of machine. So Caterpillar builds three different



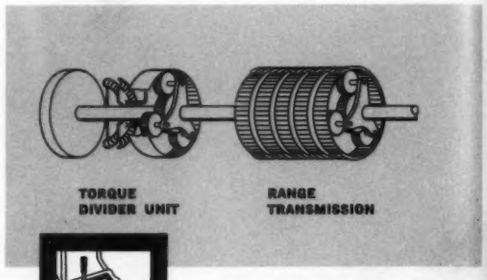
LOADER TRANSMISSIONS

Front-end loaders—both wheel and track-type—work on fast, short cycles. They crowd, dig, reverse and turn, dump, back away and crowd the pile again. They don't move far, but they move fast, cycling a couple times a minute. Shifting and bucket action must be fast and effortless if the operator is to keep up the pace all day. Maximum bucket power is needed to get full loads every time.

Full torque converter drive coupled with a power shift transmission is the combination for this application. It allows the operator to crowd the pile hard without pulling the engine down, thereby maintaining full power to bucket controls.

Travel is too short and variable to realize the efficiency of direct drive. The automatic matching of speed and torque to job conditions makes full torque converter drive the best. The operator need only watch the bucket and where he is going. When he is ready to change direction, he simply moves one short lever and he's off in the opposite way.

Power shift is standard on all wheel-type Cat Loaders and on the 977H and 955H track-type Loaders.



CRAWLER TRACTOR TRANSMISSIONS

Crawler tractor work has some of the features of loader work, plus longer travel. This application can use the advantages of both torque converter and direct drives. Take a typical job—dozing. Torque converter drive automatically provides the high torque multiplication without shifting to meet the changing load conditions while digging. But direct drive is better suited for drifting the load. Direct drive is more efficient, applying most power for pushing the load steadily for faster cycles, more positive control, greater economy.

Since there are advantages in both methods of drive, Caterpillar combines them in its power shift transmission for crawler tractors. Power is sent to a three-speed, directional transmission through a torque divider unit, with approximately 60% of engine torque multiplied by a converter and 40% bypassing it.

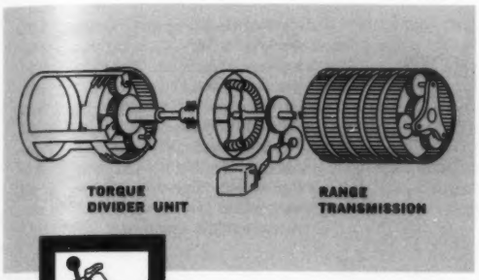
Single-lever power shifting provides instant response, up or down, on the go, in three speed ranges, forward and reverse. Direction can be changed instantly without stopping.

Power shift is standard on the D9G, optional on the D8H.

JOBS—TRANSMISSIONS

application-matched power shift transmissions for its loaders, crawler tractors and wheel tractors.

Their basic components are similar. But each transmission is designed to get the *most* production from the type of machine it is used in by matching its particular operating requirements.



WHEEL TRACTOR TRANSMISSION

As in the case of crawler tractors, there are advantages in both direct drive and torque converter drive for wheel tractor-scrapers. Variable torque multiplication without danger of stalling the engine is needed when the going is tough, as during loading. But for running down the haul road, direct drive—and overdrive—is more efficient and economical.

However, a wheel tractor's need for torque converter action is considerably less than a crawler's. So in this version of the Cat power shift transmission, only 25% of the torque is multiplied by the converter while 75% bypasses it.

This single-lever transmission incorporates a speed-sensing device that automatically provides three types of drive to the three-speed range transmission—for nine speeds with just three shifts. The torque converter is used only in torque divider drive—where it is needed to keep engine speed high. The converter is automatically locked out of direct drive and overdrive in all three operating ranges for better efficiency.

Power shift is standard on the 630A and 631A, optional on the 619C.

Phil Whitehouse, Carpentersville, Ill., bought a 977H because he believed that the power shift would be a great timesaver and production booster. And he was right. The operator has even noted that it outproduces a direct drive loader about 30% in the morning, but the gap widens to 50% as the day wears on.

George Andruss, operator for Nelson Brothers, La Harpe, Kansas: "I've stripped 420,000 yards with this power shift D8 in 1190 hours. I figure I pick up about 10 minutes more production an hour compared to a stick shift tractor. And I still feel good at the end of the day. I also like the positive, direct drive feel you get with the power shift."

Frank Hess, co-owner of Hess Construction Co., Long Beach, Calif., says 631s climb hills better than any other machines he's tried. "Automatic shifting really pays off here. The operator doesn't have to worry about a thing—it shifts automatically to make full use of engine power and to keep moving without slowing down. They shift so quick you don't even notice the smaller grades."

How Cat **LOADER POWER SHIFT** cuts time...

1 Crowding the pile demonstrates the value of the Cat torque converter drive when coupled with power shift transmission. Full engine torque and power are transmitted through the torque converter in the transmission. Result: the machine may reduce speed rapidly yet keep pushing hard without slowing the engine, and maximum hydraulic power is maintained to get full bucket loads fast.

2 Fast reversing when bucket is full. With a full bucket, the operator is ready to back up. A simple flick of the wrist moves the power shift lever into reverse. At the same time, his right hand pulls back the lift lever. The automatic kickout then takes over, positioning the bucket at dumping height. Operator is free of all controls to give full attention to maneuvering the machine.

4 Fast dumping. A finger-touch on the transmission lever puts the machine in neutral, while the right hand moves the dumping lever. As bucket empties, operator puts bucket control into tilt-back position and flicks power shift lever into fast reverse. Bucket positioner again takes over, automatically tilting bucket back to proper digging angle as machine backs up.

5 Fast return. Operator watches where he's going—not the controls, quickly shifts to reverse as bucket dumps. Right hand pushes both bucket controls forward, kickout automatically positions bucket for digging angle. Then right hand is free for steering. From crowding the pile to backing from truck, the 955H "never stops"—and handling is effortless.

increases production

3 Fast approach after turning. Operator shifts small lever to forward in one easy movement. Again, response is automatic, practically instant. Cat power shift transmission can be shifted from fast reverse to full forward, without jerking, because of the modulated hydraulic control of its oil clutches. Shifting is always a one-hand operation—no clutching, no stopping.

"Controls are so easy to handle on our Cat power shift 955, the operator keeps up a pace—all day long—that would wear him out on old-style machines in a couple of hours"—reports Curtis Geoghegan, of Lyndon, Kentucky.

Loaders call for fast shifting (and fast bucket action). That's why automatic matching of speed and torque, provided by full torque converter power shift, best matches this type of machine to job conditions. How well does it do?

Curtis Geoghegan expects more from any new model. He figured the power shifting 955H would produce about 25% more than the old direct drive model. "That would be more than enough to make it a good investment," he said. "But were we surprised! This loader is so fast and easy to operate we are getting at least 50% more production—all day long!"

Watching his loader work shows why he gets this increased production: plenty of power, live action hydraulics, automatic bucket controls and fast, job-matched power shift.

CAN YOUR WHEEL LOADER MATCH THIS?

17 tons loaded in 1.3 minutes, that's average production of five trucks loaded at Nello L. Teer's quarry near Durham, North Carolina.

It takes more than a good power shift on a wheel loader to consistently produce more. Compare Nello L. Teer's 2¾-yard Cat 966 with another make loader (with a bigger bucket) on the same job. "I can load up to 100 tons per hour more with the 966," said the operator. The reason? "It's the fast power shift transmission, fast lift and drop of the bucket, fast steering and short turning radius, and the automatic bucket positioner."

The whole machine is *fast*—it practically "bounces off the pile." And with this speed there's an ease of operation that keeps the operator feeling fit even at the end of the shift. The 140 HP 966 is the largest of three Cat wheel Loaders.

How *much* does a Cat Crawler Tractor *power shift* increase production?

The Cat D8 Series H has proven its cost saving and production superiority over other tractors on job after job. But how does the power shift D8 compare with the direct drive—does the additional 7% hourly owning and operating cost pay for itself?

Experience and many tests have shown that it does—by a wide margin. On one recent test, both models were operated side by side to compare dozing ability:

Material—clay with low sand content

Conditions—pit 50′ long; drift distance 150′

Average hourly production—direct drive: 145 b.c.y.
power shift: 185 b.c.y.

You might not get this same yardage on your job, but you should get the *27.6% increase!* And, even considering the higher cost of the power shift, it still shows a cost advantage of 17.8%.

What made the big difference? It wasn't the load on each pass. Each machine averaged 4.5 yards per trip. But the power shift D8 made *more trips* in the same time.

With power shift, the operator had practically effortless control. Under his left hand was one small lever that let him change direction or speed range in a split second—no clutching, no lost time. The operator started digging in "second"—then shifted down on-the-go to "first" to get a full blade load in a hurry. Just a flick shifted it back up to "second" for fast drifting. Shedding the load, another easy move swung the lever around into high-speed reverse for a fast return. Quick, easy shifting gave shorter cycle times.

Reduced operator fatigue permits the efficiency of Cat power shift Crawler Tractors on many jobs to be estimated at 55 minutes per hour instead of the usual 50 minutes.

Not only is the operator more efficient, but machine efficiency is increased by the exclusive torque divider design of this power shift transmission. This gives all the advantages of torque converter drive while retaining the desirable characteristics of a direct drive machine.

But the only place to prove the advantages of the Cat power shift is on *your* job. There you can compare performance with present rigs—see how much it will do for you.

"HIT THE FLOORBOARD AND LET 'ER ROLL"

That's how to get the most out of Cat wheel Tractor power shift ...how it will best adjust automatically to job conditions.

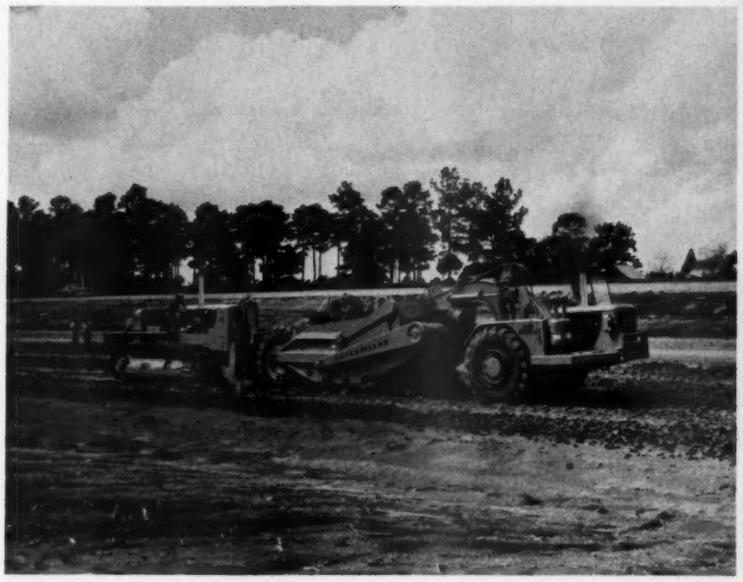
"There's only one way to drive this machine: push it to the limit all the time . . . hit the floorboard and let 'er roll. When you keep a heavy foot on the accelerator, that automatic shift does most of the work for you."

Good advice from roadbuilder O. W. Howard of Madisonville, Texas. "At first," he says, "you have to kind of get used to a big rig that's so easy to operate. But it doesn't take long on top of the 631s before you ride 'em for top production."

Cat wheel Tractors *are* easy to operate—you can push them hard in any terrain, under all ground conditions. The shift dial tells you when to shift into one of the three basic speed ranges, and the automatic transmission shifts up (or down) through three types of drive in each range for a total of nine forward speeds—more usable speed than any other rigs on the market. "Our 631s," says Howard, "give us the exact speed for every job condition we encounter practically without effort—no clutching, no hunting for the right gear."

In sticky going on Howard's 2.5-mile section of Interstate 45, his 631s have been sprinting out of the cut with 22-yard average loads of gummy, hard-to-handle Texas dirt. "Power shift does the trick," he says. "That 631 pulls full horsepower out of its diesel whether it's in the cut or barreling along the haul road."

Nothing too complicated about the Cat power shift either. It's a simple mechanical system giving you a torque converter's ability to balance speed and power and the efficiency of direct drive and overdrive. The converter in the exclusive torque divider eliminates engine stalling during loading,



keeps engine speed high. And when you're shifting up it cushions the power train. For high-speed hauling the transmission also provides direct drive and overdrive in each range for fast acceleration and a top road speed of better than 31 MPH on the 631—over 40 MPH on the 630.

THREE-TO-TWO PRODUCTION PAYOFF

Speed like that pays off: Arthur Fleming, 631 operator for Armstrong & Armstrong, Roswell, N. M., highway contractors, says he's been getting three trips for every two by competitive units on Armstrong's 7-mile Interstate 10 spread. In the pit, pulling away from the pusher, he shifts up to 2nd range in 100-150 feet, on to 3rd range in 250 feet on the level in packed sand. He accelerates coming out of the pit, up a 6% grade.

"Automatic shifting is a big help on the fill," says Fleming. "I can watch where I'm going . . . makes it easier to spread the material evenly." (State highway specifications call for 4-inch compacted lift.) "The 631 gives me a smooth, stable ride," he continues. "I can stay in my seat at top speeds over ground so rough you have to slow down other machines. The scraper is easy to load . . . that new cable control (it's air actuated) helps me to pump in good loads every pass."

Speed . . . power . . . maneuverability . . . stability . . . easy operation . . . unitized design for servicing . . . they're all there in Cat wheel Tractors to give you greater productivity and lower costs. Power shift, providing nine speeds with only three shifts, is standard on the 631 and 630, optional on the 619.

HOW RUGGED IS CAT POWER SHIFT?

Well, after 6100 hours of this...

a factory check showed this...

The Ohio River Collieries Co. liked Caterpillar's offer: namely, to trade them a power shift transmission for the old one in their D9E shown above.

Obviously this sounded good to the Cheshire, Ohio, firm. Their particular D9 had seen 6100 hours of the heaviest kind of duty. They'd worked it 22 hours a day, seven days a week, ripping and 'dozing sandstone, shale and a very hard cherty blue slate.

But it was a good proposition for Caterpillar, too. As part of a continuing program of power shift transmission research and evaluation of field performance, regular spot checks are made of transmissions that have seen rough field service.

How had this one stood up? Measurements showed that wear on all clutch surfaces and gears was slight—dimensions were still within allowable wear, except for the pinion gear, which showed normal spalling after this much use.

For the best in new and used machines, and the best in parts and service—see your Caterpillar Dealer

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DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

Form 717-34361-DE128

Printed in U.S.A.

Avoid legal pitfalls

Delayed performance was not excusable

THE PROBLEM: *A municipal sewer-extension contract required laying 20 miles of pipe, and completion within 164 days. Municipal engineers estimated that there would be only 5,000 cubic yards of rock, but actually three times that much or more was required. The city withheld $38,100 under a contract clause requiring the contractor to pay $100 a day for delaying completion. The contractor's surety on the performance bond sued to collect from the city the sum so held, plus interest. The trial judge awarded judgment in favor of the surety on a jury verdict. Did the evidence justify the award?*

THE ANSWER: No. (City of Albertville, Ala., appellant, v. United States Fidelity & Guaranty Co., appellee, 272 Fed. 2d 594, decided by the United States Court of Appeals, Fifth Circuit, setting aside a contrary decision by the United States District Court, Northern District of Alabama.)

Summary of the reasons given by the higher court for its decision:

From the outset, the contractor was informed that the approximate estimates of the quantities of different pay items were "to be used only as a basis for comparing bids for awarding the contract," and that payment would be made for "the actual quantities of the respective pay items of the work performed." Each bidder agreed that he had examined carefully the site of the proposed work, "and had judged for and satisfied himself as to the conditions to be encountered as to the character, quality, and quantities of work to be performed." In his bid proposal, the contractor specifically declared "that he had examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work was to be done; . . . that he had satisfied himself relative to the work to be performed." Further, provision was made for an extension of the time limit in proportion to the amount of any overrun in dollars. Thus, the contractor could have protected himself by bidding a higher unit price for rock excavation. Failure or delay in completing the work on time was not unforeseen, but was amply provided for in the contract. It seems clear that, at least to the extent of any impossibility or impracticability disclosed by the facts, the risk of being able to complete the work within the stated time was assumed by the contractor.

Unsuccessful low bidders not entitled to collect

THE PROBLEM: *A local board of road commissioners in Michigan awarded a public-works contract on a bid of $17,607,000—$340,250 higher than the plaintiffs' joint bid. Were the plaintiffs entitled to enjoin execution of the contract or to collect damages from the county?*

THE ANSWER: No. (Malan Construction Corp. and another v. Board of County Road Commissioners, 187 Federal Supp., 937, decided by the United States District Court, Eastern District of Michigan.) The decision is subject to review by the United States Court of Appeals.

The fact that the plaintiffs were New York concerns and not taxpayers of the county seems to have influenced the decision, although it rested on a theory that the county board acted within its discretionary legal power. Here is the substance of the court's opinion:

Competitive bidding is not intended to benefit bidders, but is designed to protect the tax-paying public from fraud or favoritism in the expenditure of government funds for public-works projects. Only the public, through a taxpayer's suit, can enjoin a proposed illegal contract.

The Michigan statute pertaining to prequalification of prospective bidders on county or other public-works projects has as its objective the removal of bids from firms or individuals later found to be unqualified to perform or complete the work, but such a statute is permissive in nature, not mandatory. A county, which in advertising for bids reserved the right to reject any and all bids, had the right to investigate bidders after opening the bids, and to adopt a bid which it found to be in the best interest of the county, even if it was not the low bid.

These brief extracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Grading in an area where the line crosses the Rocky Mountains, a D8 with Ateco ripper breaks up some slightly frozen ground on the right-of-way. A heat housing carries heat from engine to operator, keeping him warm. In the background is the Frank slide area, where a rock slide destroyed much of the town of Frank and claimed many lives.

Winter helps pipeline crews

Efficiency of men and machines stays high while cold-weather work puts job out ahead

by RALPH MONSON, field editor

Winter, even in western Alberta, was more a help than a handicap to contractors working on several sections of the 1,400-mile Alberta-California pipeline. Because work did continue right through last winter, the 300 million gas-transmission facility will be ready late this fall to begin delivering natural gas from Alberta to the San Francisco Bay area.

The winter conditions actually proved advantageous to the clearing, grading, and pipe-stringing crews. They worked straight through the winter, especially in the wooded areas, and had a substantial part of the right-of-way cleared and graded by spring.

Trenching crews experienced mixed success. Work on some sections continued at practically summertime efficiency, while other starts were abandoned as not feasible.

River crossings in Alberta, British Columbia, Idaho, Washington, and Oregon were installed during the winter low-flow periods. Even though there were some difficulties and some extra costs in the coating, wrapping, and guniting phases, the over-all operation went well.

Double-jointing yards all along the line operated throughout the winter, welding

Stringing was an ideal winter job, since most of the right-of-way was almost like a pavement. There was less wear and tear than usual on stringing rigs, and they did less damage to the right-of-way. The GMC truck and pipe trailer is delivering three 80-foot lengths of 30-inch pipe to a side-boom tractor for laying out along the trench. This is a muskeg area where travel would be difficult once frost is gone.

Clearing crews along the most northerly section of the 1,400-mile Alberta-California pipeline in winter made use of cuttings to build corduroy roads in muskeg areas. Two HD-11's and a Cat 977 walk across the riprap, as pipeliners call it, to deposit their loads at the end. They walk the material down into a solid bed that will be covered with several feet of dirt by scrapers to complete the roadway.

pairs of the 40-foot joints into the 80-foot lengths that were strung in the field. (See page 82.)

In general, winter work meant no flies, mosquitoes, poison ivy, or weight restrictions on roads; little dust or mud; etc. But there was frozen ground to dig, snow to remove, pipes to be heated for welding and coating, and the fight to be made against the general drop in efficiency of both men and machines in the cold weather.

Basically, there was an urgency to get the line completed in time to supply gas during the peak load period this winter. The project has been in the planning and negotiation stages for several years, but construction could not begin until all the required permits had been obtained. On April 19, 1960, the National Energy Board in Ottawa issued an order authorizing the export of gas. Finally, on August 16, 1960, the last barrier in the form of sanction by the Public Utility Commission of California was hurdled and the project was ready to roll. The first construction permits were awarded late in September, 1960, and work got under way almost immediately.

This urgency would have justified some winter work, even under adverse economic conditions. But with the generally mild weather throughout the Pacific Northwest in the early part of the winter, the over-all efficiency of the work was probably as high as during summer. In the winter, there were as many as 1,900 men at work on the project; last summer, the peak was around 5,000.

Winter clearing

Strangely enough, some of the most interesting and most productive winter work was done on the most northerly sections of the line.

In the wooded regions, where clearing is a major item and where the danger of forest fire is usually high

(*Continued on next page*)

In the muskeg areas, where cuttings are used for roads, an Allis-Chalmers HD-11 tractor with Drott log loader takes a big bite of logs and places them across a swampy section of the right-of-way so that rigs can get across.

One of the clearing-crew members uses a Pioneer saw to cut brush for burning. This job had to be done fast, because of the danger that snow would cover the wood and make it difficult to burn.

(Continued from preceding page)

during the summer and fall, the contractors attacked this phase of the work vigorously. Crews with chain saws, dozers, and root rakes felled and cut up the trees, salvaging some merchantable timber and stacking the rest for burning on the right-of-way.

Crews experienced in winter clearing knew a few tricks that their southern cousins had to learn. One of these was that the brush must be burned as soon as possible. The wood contains less moisture in winter and will burn readily. But, if the piles lie for a while and are covered with snow, they are very difficult to ignite.

Oil or waste tires were used to kindle the fires, and the natural draft was augmented with mechanical blowers. Some of these were small gasoline-powered fans that could be moved around by hand. Others were mounted on small tractors so that they could travel quickly along the line of fires, supplying draft where needed.

One of the clearing contractors had his root-rake tractors fitted with reverse-pitch fans. As the tractors pushed the unburned material onto the fires, their fans helped create draft. Often, the operators paused for a minute or two at the edge of the fire to add a little draft where it was needed.

Another feature that favored winter clearing was the absence of leaves on the deciduous trees. This made for better visibility in the woods and much less smoke in the burning.

Muskeg frozen

In the many muskeg and other swampy areas, winter operations had advantages. The frozen muskeg easily supported tractors and other equipment for work and travel. Through these areas, the clearing and grading crews joined to build corduroy roads (riprap in pipeliners' jargon).

Tractors equipped with alligator-jaw log loaders gathered up huge bundles of logs and piled them several feet thick over the frozen swamps. These rigs were Allis-Chalmers HD-11 tractors with Drott log loaders and Caterpillar 977 Traxcavators fitted with special log jaws by Finning

Even in the bush country north and west of Edmonton, frost presented only a small problem and snow cover helped limit its penetration. Majestic Contractors, Ltd., Toronto, with six D7's and two D8's, was able to break through the foot or so of frost. Frozen chunks were dozed aside; grading was done in unfrozen areas.

A Bucyrus-Erie 22-B backhoe excavates a trench up a steep grade while a D7 helps hold it steady. In this area, much of the trench was ripped, and some drilling and blasting work was required. But these jobs went along as well in winter as they would have in warm weather.

Tractor Co., Vancouver.

Where riprap had to be transported considerable distances, these rigs carried double loads. They slipped a cable around one load and winched it up tight against the rear of the tractor, then, turning around, they gathered another load in the jaws and traveled off down the right-of-way looking like big walking brush piles.

The logs were deposited along the working side of the right-of-way and crossways to the right-of-way, to a depth of about 3 feet. The brush was piled on the right-of-way and burned.

Grading crews placed a foot or more of earth fill over this riprap. The work was commonly handled by a Cat D7 and No. 70 scraper assisted by a dozer. The material was usually obtained from a nearby knoll on the right-of-way, but sometimes it had to come from borrow areas outside.

The heavy corduroy accomplished one or both of two purposes. If the muskeg was frozen to a good depth before the riprap was placed, the wood and earth blanket served as an insulator. This held the frost in the muskeg and kept it solid well along into the late spring. When the swamp thawed out, the riprap served to bridge the soft material and support the loads of the pipelaying equipment that had to travel the right-of-way.

At some of the worst swamps, stockpiles of the riprap material were stored beside the right-of-way to be used in case of a breakup of the road as originally built.

Grade crews break frost

Grading crews found enough advantages to counteract working in cold weather. Being able to get over muskeg and other swampy areas without bogging down compensated for most of the hardships.

With snow cover as an insulator, the frost penetration was usually less than a foot. The rippers and dozers of the grading spreads were able to break through this rather easily. Pushing the frozen chunks into waste piles, they used the unfrozen material underneath for grading. In many cases, they found unfrozen ground as soon as they dozed off the snow cover.

The contractors found that areas of wet soil drained and dried up more quickly when opened and graded in

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The warming fire beside the right-of-way was a common sight wherever crews worked on the ground. Some time was lost this way, but the men usually worked so vigorously that they were as productive as during the summer, when mosquitoes and heat would have been problems.

other heavy equipment were forbidden the use of most roads for a period varying from a few weeks to two months in the spring, when frost was going out of the ground and subgrades were soft. Where the pipe had been strung during the winter, this was no problem.

Swamp weights were required on the pipe through many of the muskeg swamps and other wet areas. These were precast of heavy concrete in central plants and trucked out to the right-of-way. Stringing these heavy weights along the right-of-way was another operation that handled well in winter.

Since there was ample time during the summer to do the welding, coating and wrapping, laying in, etc., there was no real point in attempting these operations in winter. The fact that the clearing and grading and some trenching were done in advance made it possible for the following operations to proceed without interruption once they were started in the

(*Continued from preceding page*)

the winter rather than in summer.

A number of crews started trenching operations during the winter, and some continued throughout the cold weather. Sections of rock excavation could be drilled, shot, and excavated just as well during the winter as at any other time, and this work continued throughout the cold months.

One contractor tried trenching through muskeg, knowing that it was much easier to dig through a little frost in winter than to fight the soft muskeg in summer. Three Cleveland 320 trenchers and a pair of Insley hoes started this operation. They progressed very well through the muskeg but could make little progress through the frozen solid ground in the areas between the swamps. This made the over-all operation too inefficient.

After looking over the oozing muskeg that had been trenched, the contractor was not at all positive that the trench would remain open when the frost went out. This phase of the trenching was suspended for the winter. In the summer, the softer swamps had to be trenched by clamshell, with the cranes standing on the corduroy roads.

Stringing goes well

Accustomed to fighting mud much of the time, the stringing crews really had a heyday wherever they could get the pipe out on the right-of-way during the winter. The well graded frozen right-of-way was like a pavement to the trucks that carried three 80-foot double joints to a load. This operation progressed faster than usual, and there was far less wear and tear on the trucks.

There was a secondary benefit in winter stringing. In the process of getting the heavy stringing trucks in and out, these crews frequently mess up the right-of-way road, making it difficult for other equipment to follow. On the frozen ground, they barely left tracks.

Another major factor affecting all operations, but particularly the stringing, was the posting of roads during the spring breakup. Heavy loads such as the pipe trucks and

early summer. This is where the winter work really paid off.

Starting in the east foothills of the Rocky Mountains some 150 miles northwest of Edmonton, Alberta, the Alberta-California pipeline follows the east side of the mountains to within 50 miles of the Montana border. A branch line goes into Montana.

The main line swings west over a pass into British Columbia, crossing the rugged Rockies and emerging in the Idaho panhandle near Bonners Ferry. It passes between Spokane and Coeur d'Alene, slices across eastern Washington, and through central Oregon and northern California to its terminus at Antioch on San Francisco Bay.

The 351 miles of main line in Alberta is divided into four schedules. Schedule IV at the north is being built by Dutton-Williams Brothers, Calgary. Schedules I and III were awarded to Majestic Contractors, Ltd., of Toronto. Schedule II and the Montana delivery lateral called Schedule V are being built by the Alberta Consolidated Pipe Line Builders, Calgary. In addition to the main line, these contracts include laterals into the gas fields.

The Alberta section of the pipeline is owned and operated by the Alberta Gas Trunk Line Co., Ltd. The engineering and construction supervision on this section are provided by Canadian Bechtel, Ltd.

The 107-mile section through the rugged southeastern corner of British Columbia is being built by a joint venture of H. C. Price Co. of Canada, Ltd., Calgary, and Poole Construction, Ltd., Edmonton. This section will be owned and operated by the Alberta Natural Gas Co. Engineering and construction management are handled by Canadian Bechtel, Ltd.

South of the border, H. C. Price Co., Bartlesville, Okla., is building two sections, one from the international boundary to Rosalia, Wash., and the other from the Oregon-California border to Antioch. The 468-mile section joining these is under construction by a joint venture of Western Pipeline, Inc., Austin, Texas, and J. P. Neill & Co., Inc., Dallas.

The portion of the line in Idaho, Washington, and Oregon is owned and operated by the Pacific Gas Transmission Co. with Bechtel Corp. supplying the engineering and management of construction. In California, the line is owned and operated by the Pacific Gas & Electric Co., San Francisco. PG&E handles its own engineering and construction management.

PG&E is chief sponsor of the entire project with the exception of the Alberta Gas Trunk Line Co., an independent contract carrier. The other pipeline operating companies, as well as a gas purchasing company in Alberta, are PG&E affiliates.

As it is now being built, the 36-inch line with four compressor stations will deliver about 414 million cubic feet of gas daily to Antioch. This is about one-fifth of PG&E's average daily demand. With the addition of more pumping stations, the capacity of the line can be more than doubled. THE END

Four rules to aid winter driving

■ Contractors who work through the winter can cut down on accidents and speed up the job by having their drivers observe some simple rules:

1. Stay well behind the plow trucks. By following safely behind a snowplow, a driver has the advantage of a cleared highway and avoids the chance of stalling and creating a traffic jam. Also, many accidents occur when a car passing too close to a snowplow strikes the blade.

2. Keep a safe distance behind sand trucks and you'll avoid being struck by materials from the spreader. Remember that the operator cannot always see anyone attempting to pass.

3. Get stalled vehicles as far off the roadway as possible, and leave the lights on to act as a warning to highway-equipment operators and other motorists.

4. Use chains or snow tires and be sure windshield wipers and defrosters are in good operating condition.

Cyanamid division names

■ The Organic Chemicals Division of American Cyanamid has announced the appointment of A. J. Perantoni as advertising and promotion manager of the intermediates, explosives and mining chemicals, and the refinery chemicals departments. His headquarters are in the general sales offices of the division at Bound Brook, N. J.

About the only operation needed because of cold weather during double-jointing of 30-inch pipe for the Alberta-California natural-gas pipeline was the heating of the end of the pipe to eliminate moisture in the area of the weld. A Crose-Perrault butane preheating ring brings the pipe to at least 175 degrees.

Using a special-type fork, a Michigan 175A carries 40-foot joints of pipe to the rack that feeds the double-jointing crew of Dutton-Williams Bros., Ltd. at Cynthia, Alberta. The end of the pipe is first heated. Instead of using a side-boom rig, which would have required three or more men, the contractor uses this rig in a one-man operation.

Pipeline crews add a few heaters . . .

Winter doesn't sto[p] ou

Workmen donned coats and caps and set up a few heaters at strategic points around the plants. Otherwise, the double-jointing of the 1,400 miles of pipe for the Alberta-California natural-gas pipeline that proceeded throughout last winter on a "business as usual" basis. One of the plants, at Yahk, B.C., regularly turned out the 80-foot double joints of 36-inch pipe at a rate of 12 per hour.

A typical operation in what may have been one of the coldest spots was the yard at Cynthia, Alberta, some 125 miles west of Edmonton at the western edge of the famous Pembina oil and gas field. Here Dutton-Williams Bros., Ltd., Calgary, double-jointed 63 miles of 30-inch pipe for placement in Schedule IV of the Alberta Gas Trunk Line section of the project.

The pipe, in 40-foot joints, had been delivered by rail to MacKay and trucked 35 miles to the Cynthia location before the portable double-jointing plant arrived. Less than a day after the three truckloads of "plant" pulled onto the site, the set-up was in operation.

To move the pipe from the stockpiles to the feed rack of the plant, this contractor used a Michigan 175A tractor shovel fitted with a special pipe-carrying fork. One operator with this machine picked up the pipe two at a time, carried them across the yard, and placed them gently on the inclined feed rack. No helpers were needed; the operator did not have to leave his seat in an enclosed heated cab, and the rig easily kept pace with the plant.

As the pipe rolled down the rack toward the welding station, a workman with a Crose-Perrault butane preheating ring heated the ends of the pipes up to at least 175 degrees. A special marking chalk indicated when this temperature had been attained. This heating eliminated all

Inside welds are made by this man and a special welding machine, which go into the pipe on the end of a boom. While he is out of the pipe, the workman is protected from weather by the shelter. Boom and welder are made by M. J. Crose.

The boom that carries man and welder inside the pipe is shown in the withdrawn position. Welding power cord is carried on the power reel that pays out or draws in as the boom rolls in and out of the pipe. The remainder of the assembly at the end of the pipe moves on rails supported by timber cribbing. The big trailer at left houses the Cat D337F power plant that supplies all plant units.

to ouble-jointing of pipe

water from the pipe in the vicinity of the joint.

At the welding station, the pipe joints were butted together and held in alignment by an air-powered internal alignment clamp. The outside weld was made by a Lincoln submerged-arc welder that always operated in a vertical position as the pipe rotated beneath it. The welding rod and flux fed automatically from a spool and hopper, respectively, mounted above the welder.

The welding station was covered by a canvas cover on a wood frame, and a big Jaeger space heater nearby supplied a blast of warm air on the coldest days. Other than this and a few oil salamanders to help the workmen keep warm, there was no special winter protection.

At the next station down the rack, the inside weld was made. On this operation, the contractor used an M. J. Crose boom rig. The lead end of the boom, riding on casters inside the pipe, carried a Lincoln submerged-arc welding unit together with the operator, who rode in a prone position. The other end of the boom was attached to the propelling mechanism that traveled on rails supported on cribbing.

(Continued on next page)

The 80-foot-long double joints of pipe are picked off the rack by a side-boom tractor and carried to stockpile. One of the plants supplying pipe for this 1,400-mile line turned out 80-foot double joints of 36-inch pipe at a rate of 12 per hour.

This little enclosure over the welding machine is the only protection against weather in the entire Dutton-Williams Bros. plant. A heater warms the area as the 30-inch pipe is being welded by a Lincoln unit.

A big Jaeger oil-burning heater, made by Jaeger Machine Co. of Canada, Ltd., St. Thomas, Ont., helps keep workmen warm in the welding area on the Dutton-Williams Bros. job.

This is 36-inch pipe in the Price-Poole plant, Yahk, B. C., an internal clamp holds the two joints of pipe in proper position while welding is done. The salamander beside the shack helps keep the crew warm when not busy.

(Continued from preceding page)

As the pipe rolled into position, the boom carried the operator inside to the joint. Here he made the inside weld as the pipe rotated around him. His welding machine was always working in a vertical position as the pipe rotated. With the joint complete, the boom brought the operator back out, and the completed double joint of pipe rolled on. Out of the pipe, the operator was protected from the weather by a canvas cover over a wood frame.

The completed double joints rolled to the end of the rack where they were picked off by a side-boom tractor and carried to stockpile or loaded directly onto the stringing trucks.

X-ray all joints

After both welds were completed, the joints were completely X-rayed. The X-ray technicians probably had more trouble with the cold than any other men on the setup. Trying to keep their developing and fixing solution at 68 degrees in their mobile darkroom kept them busy. Small electrical heaters suspended right in the solutions proved to be the most effective heating method.

A Caterpillar D337F generator unit supplied power for the entire plant, including the welding generators. This unit was permanently mounted in a large trailer with doors that opened to expose the radiator.

On other sections of the pipeline, other contractors had slightly differing double-jointing operations. But virtually all of the main line pipe was double-jointed and strung on the right-of-way in the 80-foot double lengths.

Personnel

On the Dutton-Williams Bros. double-jointing operation, Ed Maddans served as superintendent for the contractor. Harland Evans was superintendent of the spread. For Canadian Bechtel, Eric Ericson was inspector at the double-jointing plant.

THE END

Esco names veep

■ Henry T. Swigert has been appointed vice president, finance, of the Esco Corp., Portland, Ore. He joined the firm in 1955, and for the past two years has served as sales representative in Phoenix, Ariz.

Army tests snow-tunnel maintenance equipment

■ Special snow equipment designed to keep open Camp Century, an Army research base built under the ice in Greenland, has been undergoing tests. The equipment was designed and fabricated by the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

The Army needs a method of removing snow and ice that builds up inside tunnels because of the weight of overlying snow. The equipment, designed for 2-man operation, includes a scaffold-mounted rotating cutting head to remove the snow in 6-inch increments and pulverize it in the process. The cutting head is enclosed in a metal hood, with pneumatic ducts used to convey the snow to disposal areas.

Also undergoing tests are modified chain saws and hedge trimmers to remove snow in areas inaccessible to the scaffold. Snow melters, subsurface sumps, and surface dispersal methods will be evaluated, too.

A Bay City truck-crane threads Armco interlocking steel sheet piling into a panel as a 3-inch slot, cut through the surface of frozen lake, acts as guide. The pile is allowed to freeze in place, and is later driven to proper penetration for seaplane docking facilities.

Quick-freeze method guides sheet piling

■ By sawing a slot through the surface of a frozen lake, the Four Star Construction Co., Superior, Wis., developed a way of guiding steel sheet piling last winter during construction of a seaplane base at Shagawa Lake in Ely, Minn.

This unique method, resulting in sizable cost reduction for the contractor, consisted of cutting a 3-inch-wide slot in the ice with an electric saw, then setting Armco lightweight interlocking sheet piling in the slot and allowing the sheets to be frozen in place. After the contractor set up a complete wall panel, sheet piling was driven to proper penetration with a drop hammer swung by a truck-mounted crane riding the frozen lake's surface.

Lightweight Armco interlocking sheet piling was driven into the stiff clay at the bottom of the lake and, after ice melted, backfilled to form a docking bulkhead.

Illinois university opens traffic safety center

■ The University of Illinois College of Engineering has established a Highway Traffic Safety Center to coordinate the university's programs in this field and to work with outside agencies. Prof. John A. Baerwald, of the civil engineering department, will direct the center, which will develop and conduct training programs, special studies, surveys, and other services in public safety and traffic-accident prevention.

New York leads nation in Interstate mileage

■ At mid-year, New York State still led the nation in the development of its interstate highway system, according to J. Burch McMorran, state superintendent of public works. The Empire State had 56 per cent of its allotted mileage open to traffic, compared to 26.6 per cent open in the rest of the country. A major factor in this lead is the incorporation of most of the existing New York State Thruway into the Interstate System.

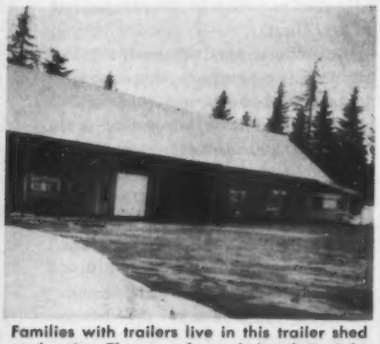
Road maintenance cre

Keeping a highway clear of snow and ice means having men and equipment available on the spot when they are needed. At more remote maintenance stations—like those at Timberline Junction and Odell Lake—the Oregon highway department maintains living facilities right on the site for the supervisors and workmen and some of their families.

At Timberline Junction, on the slope of Mount Hood, as many as 30 men, and the families of ten or more, live in the station's housing facilities

One of the biggest winter jobs for Snogos is keeping the big parking lot clear at the Mount Hood winter-sports area. On weekends, skiers and other winter-sports enthusiasts flock to the slopes, and new snow generally means bigger crowds that expect to find the roads open.

Snow-fighting crews at Timberline Junction Station, Oregon, have living facilities on the grounds. Houses like these are for supervisory personnel.



Families with trailers live in this trailer shed at the site. The open-front shelter has eight trailer stalls, each with power, sewer, and water connections.

Offices for the highway department and U. S. Forest Service, and two dormitories—for men without families at the site—are in this building at the station.

One of the new sanding rigs at the station pulls out of the garage on its way to work. Six of the bays are kept warm for maintenance work.

e with their work

during the snow season, which usually lasts from mid-November to mid-April.

The supervisory staff members and their families occupy four modern and attractive two-bedroom houses. Some of the workmen and their families live in their own mobile homes that are housed in a large shelter. This open-front shelter has eight trailer stalls, each with its own sewer, water, and electrical connections. A central service room contains laundry, washrooms, showers, etc., for the use of these families. The roof and three sides of the structure shelter the trailers from wind and snow. This is important because the snow reaches depths of 6 to 12 feet, which would damage the house trailers because of its weight.

Dormitories for men

The single men and those whose families are not at the station live in a large dormitory. Separate sleeping quarters for day and night crews are located at opposite ends of the second floor of the building. This gives members of each crew an opportunity to sleep without being disturbed. Washroom facilities are in the center of the building. Each section of the dormitory can sleep as many as 25 men, although the crews are never that large.

On the lower floor of this building are two apartments, kitchen and dining facilities, and offices for the Highway Section and for the U. S. Forest Service. The kitchen and dining room were not operated last season—though men prepared snacks there—since restaurant facilities were available at all times in the nearby town of Government Camp. The state collects a nominal rent for the use of all of the facilities.

Having these crews living on the station means that there is never a delay or a manpower shortage when the winter emergency situations arise. Day and night patrols sand icy spots on the road as they develop and remove any rocks or other debris on the roadway.

Fight snow around the clock

When a snowstorm is developing, these crews begin an around-the-clock battle that lasts until the highways are clear again. As soon as there is any appreciable accumulation of snow, the motor graders and truck plows begin plowing the traveled roadways, pushing the snow to the shoulders and ditches. On the wider roadways, as many as three truck plows work in tandem. A lighter rig makes the first pass, and one of the big Walters or other heavy plowing trucks brings up the rear, pushing the entire accumulation far off the road.

These rigs plow as soon and as often as possible to prevent the buildup of a heavy pack on the traveled roadway. They also plow at as high a speed as conditions will permit so that snow is thrown as far off the roadway as possible.

During a storm, and possibly for some time after, the crews make no attempt to remove the accumulated pack down to clear pavement. They find that a reasonable depth of snow pack, sanded where necessary, provides good footing for vehicles with chains. It does not develop the dangerous icy spots that are likely to occur when attempts at attaining bare pavement are not quite successful.

Chains are required

In the snow zones, vehicles are required to have chains whenever there is snow or ice on the road. Signs to this effect are installed at various points along the highways. These signs are folded up and locked to hide

Conferring at the desk of timekeeper John Mason in the station office, Glen Roberts, left, section foreman, and Darel D. Rohrbough, district maintenance superintendent, talk over the opening of a closed road.

Rotaries are called into action for heavy work like this, which is more than push plows can handle. Crews work right through a storm, then keep on clearing the accumulated pack long after a snowfall is over. A reasonable depth of pack is left and sanded, when necessary, to provide footing for vehicles with chains.

Snogos and a Bros rotary on hand. These rigs fight through the heavy drifts or blow away the snow in areas where there is not room for the push plows to handle it.

Where high banks occur, the wind sometimes blows the snow into overhanging drifts or cornices, and these have to be removed as soon as possible before they slough down onto the roadway. One common method is to cut these slopes back with a wire that is carried up on the drifts by hand and then pulled taut by trucks. As the cornice is brought down, the rotary plows blow the snow back from the roadway.

Removing the pack

After a storm has subsided and the roads are open to traffic, the crews continue to work with the accumulated pack. They treat the slippery spots with salt and sand to maintain the safest possible driving conditions. At the same time, the motor graders with serrated blades scrape away whatever loose material they can get. Taking advantage of any warm weather periods, they may get the

(Continued from preceding page)

the lettering when they are not needed. When road conditions dictate the use of chains, the signs are opened to expose lettered faces reading "Put on Chains."

The Oregon state police enforce the chain requirements. When these are in effect the department's radio system proves its worth. The pickups of the supervisors and some of the plowing and sanding trucks are equipped with mobile radios that operate on two frequencies. One is assigned to the maintenance department for intercommunication. The other is the state-police frequency. This makes it possible for the maintenance patrols to keep in touch with the police for the quickest response to emergency situations.

Use rotary plows

When the snow accumulates on the roadway or shoulders to greater depth than the push plows can handle, the rotaries are called out. The Timberline Junction station usually has four

Overhanging cornices caused by wind-blown snow are a hazard; one is being removed just below Mount Hood by a cable, anchored above the snow by a workman on the bank and attached to a truck that backs up to draw the line taut and slice off the heavy snow.

entire pack removed down to bare pavement before another snowfall occurs. This, however, is not necessarily a vital consideration.

Advance preparations help

Although the actual snow plowing is the most spectacular part of the winter maintenance program, the advance preparations are probably the most important. These include the erection of roadside guide poles, stockpiling of sand and salt, and the conditioning of the equipment.

Snow poles are set up at frequent intervals to delineate the outside line of the roadway shoulders. These are 10 to 16-foot poles cut locally, seasoned one year, and painted red. Near the tops they are given a coat of reflectorized paint containing glass beads—like that used for painting traffic guide lines on pavements. These poles, set up in the fall while the ground is unfrozen, serve as excellent guides, both for the plowing equipment and for traffic.

The preparation and stockpiling of sand and chemicals are also important preparatory operations. The Oregon department contracts with suppliers for its winter supplies of sand when this is practical. In the Mount Hood area, it is most economical for department forces to prepare the sand. A screening plant on the White River removes the oversize on a steeply sloping 1-inch screen that produces a material with very little larger than ½-inch.

Material stockpiles

Trucks haul this sand to the big 60 × 140-foot sand shed at the Timberline Junction yard. Here, rock salt is added at the rate of 20 pounds per cubic yard, and the mixture is pushed up into stockpile by a dozer. As it is needed, the material is loaded directly into the sanders by Scoopmobiles. Additional salt is usually added at this time. Stocks of rock salt and calcium chloride in sacks are maintained at the sand shed.

The setup at Timberline Junction includes a big new 10-yard hydraulic-powered sander mounted on an International 10-wheel truck. This crew also uses a lighter truck equipped with a tail-gate sander.

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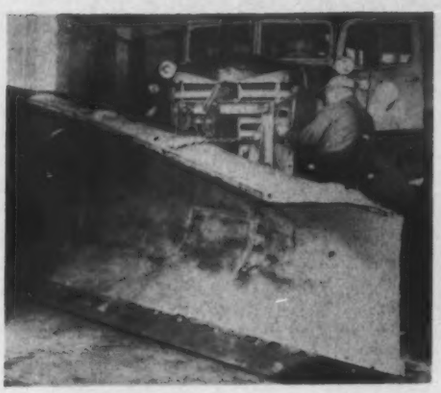
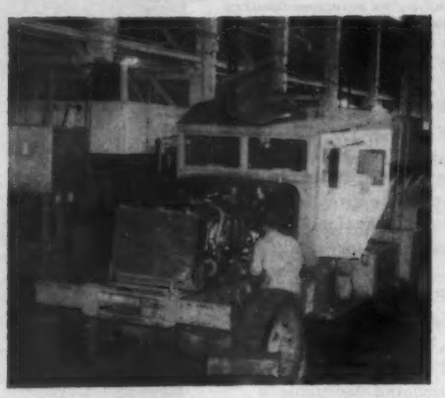
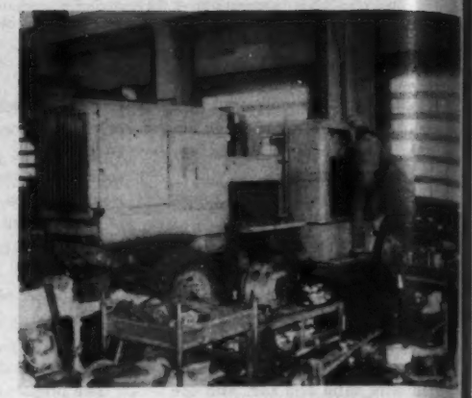
Shop maintenance for clearing crews at Timberline Junction . . .



Most of the repair work needed during the snow season is done in the heated bays of the garage at Timberline Junction; minor repairs are being made at this point on a big Walters snowplow unit.



In the main shops at Salem, the equipment division maintains equipment used by the maintenance districts. A Ward La France truck with hydraulic spreader is being repaired here.



In another shop in the Salem central shop area, a Snogo is being overhauled before being sent out to one of the maintenance sections. During winter, only emergency work is done here; summer is reserved for overhauls.

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Equipment is rented

The winter maintenance equipment, like all other equipment used by the maintenance division for either maintenance or construction work, is supplied on a rental basis by the department's equipment division. This division purchases all of the equipment and handles major repairs and overhauls in its five shops scattered throughout the state.

Winter equipment, like the Snogos and sanders, is sent to these shops for overhaul during the summer months. The rigs from Timberline Junction go into the central shops at Salem, more than 100 miles away.

While they are at work, the machines are serviced and maintained by the section crews, each driver being responsible for the daily servicing and fueling of his rig. Most of the repair work during the season is also done at section headquarters to save the time and expense of getting the machines to the shops at Salem and back again.

At the Timberline Junction yard, one full-time mechanic is on duty throughout the season. The drivers and laborers help him make necessary repairs whenever a machine is down. At this station, the equipment is all stored indoors in a large garage building measuring 308 × 36 feet. This building has 20 bays, each with its own door opening directly into the paved yard of the station.

Six of these bays are heated, while the others are kept just above freezing. All of the maintenance work is done in the heated bays, which are also equipped with lubrication and general-maintenance equipment and supplies. A Caterpillar D318 generator set in the garage provides 50 kilowatts of emergency power for use in case of an interruption of the regular commercial power supply. This is sufficient to supply at least minimum needs to all the housing, office, radio and other yard facilities, as well as to the shops.

The water supply for the station comes from a spring high up on Mount Hood. The water flows to an underground tank that feeds the station by gravity.

The section of highway from Tim-

berline Junction around the east side of Mount Hood and north to Hood River is not maintained during the winter because of the danger of avalanches and because there is little winter travel in this direction. But opening this road in the spring is sometimes a big job.

When the first snow of the season hits this road, the crews apply a liberal dose of rock salt. Then they erect the signs indicating that the road is closed, and forget it for the winter. The salt helps keep the snow pack and ice from freezing to the pavement, thus facilitating the cleanup in spring.

Weather and road report

The daily weather and road-condition report issued by the Oregon highway department provides an important service to road users. The department's radio and teletype services gather and disseminate the information.

Early each morning during the winter, the field headquarters throughout the state report the weather and road conditions by radio to key stations where teletype facilities are available. An operator at the teletype in the central office then starts the coded daily report, waiting in turn while each station supplies the information from its area. This report is then decoded and released as a morning news bulletin.

The same information goes by teletype to the AAA, U. S. Weather Bureau, State Motor Vehicle Department, and the 20 stations of the highway department that have teletype facilities. The Motor Vehicle Department forwards the information to 90 state-police units that have teletype.

The information is also exchanged with Washington and California, so that each state has daily information on the highways connecting them.

The teletype and radio systems also serve to distribute weather reports supplied by the U. S. Weather Bureau. These are sent out at least twice daily to all of the maintenance sections.

Administration

The maintenance division of the Oregon State Highway Commission is headed by maintenance engineer I. A. DeFrance. From him, the authority is passed directly to the division engineers of the state's five geographical divisions. In each of these divisions, there is an equipment superintendent in charge of the equipment and shops, and several district maintenance superintendents in charge of the highway maintenance. Each maintenance superintendent has section foremen and crews scattered throughout the area he supervises.

Following the chain of command from DeFrance, the division engineer for the Portland Area Division is A. E. Johnson. The district maintenance superintendent for district 1B of this division is Darel D. Rohrbough. Among the sections supervised by Rohrbough, the largest is the one located at Timberline Junction, where Glen Roberts is the section foreman.

THE END

A RUNWAY IS CLEARED at New York's Idlewild Airport by one of the Snowblast rotary plows that will be handling the job this winter. Two machines tested for the work did so well that an order for nine plows was placed. A Snowblast technician is stationed in New York to assist the airport in the development of new procedures and to train operating and maintenance personnel.

It takes special techniques for

Earthmoving at 10 below

D8's equipped with dozer blades crowd sand from a large roadway cut toward the receiving hopper of the Kolman belt loader (not shown). Four D8's were used in this hopper-feeding operation.

Given the right kind of job and an experienced contractor, dirt can be moved profitably in temperatures down to 10 below zero.

The dirt can be moved—but it takes some extra doing. It takes a knowledge of cold-weather earthmoving techniques. It requires a foolproof equipment maintenance program. It takes men who are willing to get out in the cold and go to work.

Equipped with all of these, C. P. Replogle Co., Circleville, Ohio, challenged northern Michigan's winter on a 3.2-million-cubic-yard grading job. The $3,589,000 contract for 4.1 miles of Interstate 75 also included the paving and seven bridges.

The work is located in the deep-freeze country near Indian River, Mich., about 30 miles south of Mackinac Straits. In this region it is not unusual for temperatures to drop to 20 below. At one time during the grading, the mercury retreated to the little ball at the bottom of the thermometer. It was 38 degrees below zero. The men stayed home that day, but they were out again when the temperature rose to a balmy 10 below.

By October of 1962, Replogle expects to have completed its segment of the four-lane divided highway. By December of next year, the entire 224-mile Interstate route from Lansing to Mackinaw Bridge is expected to be open to traffic.

Replogle's contract was well suited to winter grading. The earthmoving consisted of excavating muck from the roadbed and building the fill up with sand. Of the total of 3.2 million cubic yards of excavation on the job, about one million was muck, 1.9 million was borrow, and the remainder was roadway cut. Since most of the borrow and cut material was dry and granular, it was resistant to frost.

Not everything worked to the contractor's advantage, however. Haul roads on the sand fill did not freeze up to give a hard, pavement-like surface. To take care of this difficulty, the contractor wet the haul roads to permit the surface to freeze. In order to make the sandy material more stable, crews spread topsoil on the haul road running along the shoulder of the new highway. This material later had to be removed.

Belt loads scrapers

An unusual method was employed to load the scrapers in the borrow pit area. The sandy material did not lend itself to push-loading; even with two Caterpillar D9 pushers in tandem, it

◄ Replogle's field headquarters area, with Heltzel batch plant rigged up for winter operation. Aggregates were heated in the overhead bins by a Bros 65-hp boiler.

Replogle's mechanics worked in comfort in this steel shop building set up near the field headquarters. Shelter-like extension in foreground protects heavy parts from the weather. ►

was nearly impossible for a scraper to pick up a full load.

To remedy this difficulty, the contractor first tried topping out the loads with a 36-inch belt loader. The scrapers were push-loaded to about two-thirds capacity and then belt-loaded until full.

Later, the contractor put a Kolman 60-inch belt loader on the job. With this high-capacity machine, the scrapers were loaded from empty to full in a matter of seconds.

The operation proved to be fast and efficient. Loading time was cut in half. The belt spewed sand into the scrapers at the rate of about 1 cubic yard per second. The scrapers, equipped with sideboards, carried capacity loads. Wear and tear on the push dozers was avoided.

In this operation, four D8 dozers pushed the sand into the receiving hopper of the belt loader. Moved along by a reciprocating feeder at the mouth of the hopper, the material dropped on to the 60-inch belt where it was rapidly conveyed to the waiting scraper.

The scraper fleet of 18 units included some high-capacity rigs. The biggest was an MRS 250 tractor pulling a MRS 45-yard pan. Three MRS 250 tractors pulled Wooldridge 37-yard pans. Six MRS 200 tractors lumbered down the haul road pulling Caterpillar 90 pans. To round out the fleet, the contractor had five DW21's and three DW20's.

The scrapers had a long way to carry their heavy loads. The average

(Continued on next page)

Working from a shelf at the edge of the sand fill, this Lima 1201 with Owen clam bucket mucks out the area ahead of the fill. Because the stiff marl would not displace under the weight of the fill, excavation had to go down 20 feet.

Equipped with side sheets to give the operator some protection, a D9 pushes material dropped by scrapers to the forward end of the fill.

On the fill, D8's and D9's help the scrapers unload and spread the material. In the foreground, a D9 helps unload a Caterpillar 90 scraper.

At the rate of a yard a second, sand from the Kolman 60-yard belt loader pours into a Wooldridge 37-cubic-yard scraper pulled by an MRS 250 tractor.

(Continued from preceding page)

haul to the fill was 1½ miles. The longest was 2½ miles

Spearheading the operation on the fill were two big draglines. The Lima 1201 and the Lima 703 worked from shelves on the end of the fill to muck out the peat and marl. As the clamshells pulled out the muck to depths of about 20 feet, D8 and D9 dozers pushed ahead the material dropped by the scrapers. The dozers also assisted the scrapers in unloading. To reduce the hazard of getting frost in the material, the fill operation at any one time was confined to a fairly short length.

In the marsh area on both sides of the Indian river, the fill was built up about 20 feet above the natural ground. Excavation ran 12,000 cubic yards per station, and fill ran about 24,000.

Considering the length of the haul and the time of the year, production was reasonably good. During December, January, and February, Replogle moved about 800,000 cubic yards of sand and 400,000 cubic yards of muck. Average daily production using 13 haul units was about 20,000 yards.

The muck excavation was considerably more extensive than either the state or the contractor figured on. It was expected that the weight of the sand fill would displace the lower levels of the muck. This didn't happen. The muck, composed mostly of marl lower levels, was too stiff to displace. Thus the contractor was forced to revert to a complete excavation method with a surcharge.

The stability of the high sand fill was consolidated by jetting it with water. The jets were set in on a 10-foot grid, and the entire fill thoroughly soaked with water. Since this added greatly to the weight of the fill, it settled any weak spots in the underlying marl. The water also consolidated the sand fill.

The project is being supervised by the Michigan State Highway Department with Millar Fleming as resident road engineer and Charles Ellis as resident bridge engineer. For Replogle, Victor Burdick is area superintendent. Bill King is job superintendent and Ed Murphy is equipment superintendent. THE END

Crews work inside a polythene enclosure to make winter repairs on Mississippi Lock No. 1, near Minneapolis. Here, dowels of reinforcing steel are being grouted into the existing framework at the lock's base. The adhesive mortar used bonds the dowels and new concrete to old, forming a strong, watertight structure.

Concrete adhesive aids winter lock-repair job

■ Concrete construction in temperatures to 15 below zero was required for repairs to Mississippi Lock No. 1, near Minneapolis, so that the lock would be ready for the shipping season this spring. The job was done under the supervision of the U. S. Army Corps of Engineers.

Since soil condition prevented the driving of sheet piling to reinforce the lock's base structure, additional sections of reinforced concrete were added. A concrete adhesive compounded with a base of Thiokol polysulfide polymer was specified as the bonding agent between the new and existing concrete.

A second phase of the reconstruction project involved the erection of additional vertical columns to reinforce the lock's side walls. This time, the adhesive was employed for grouting steel dowels into the existing walls to serve as a tie between old and new concrete units.

Because of low temperatures, Ashbach Construction Co., St. Paul, had to heat the concrete-placing area. Work areas were enclosed in a framework covered by polyethylene film and warmed with propane heaters to 60 degrees. A smiliar enclosure, heated to about 75 degrees, was provided for the adhesive preparation area. Five-gallon batches were mixed with an electric drill fitted with a paddle attachment.

On the base structure, adhesive was brushed onto the existing concrete slabs where they joined new sections, after reinforcing steel work was installed. Immediately afterwards, the new concrete was placed and finished according to standard practice. The adhesive provides a bond that makes the new cured concrete essentially one continuous structural unit with the old sections.

For grouting dowels into vertical walls, plans specified that each unit of adhesive be combined with dry sand equal to 1¾ times its weight. This mortar was forced into drilled holes by compressed-air-operated augers. Dowels inserted into the grout-filled holes became tightly bonded within 24 hours, and the new concrete columns were poured in place, enclosing the dowels and forming an unified structure.

CABLE TRENCH FOUR FEET DEEP CUT BY HYDRAULIC RIPPER

More than a million feet of ditch is being cut by this Gar Wood hydraulic ripper at Plattsburgh.

The ripper is drawbar-mounted to the Euclid C-6 tractor frame, eliminating any pull on the transmission case. The cast alloy steel tooth is triple-wedged for positive retention, yet is easily changed. The powerful hydraulic unit with its straight-down thrust rams locks to maintain unvarying ripping depth, and keeps the ripper cutting through the rockiest terrain.

Highway engineers make TV road-program report

■ Virginia highway-department engineers took to television recently in several cities to explain to the public the state's billion-dollar role in the interstate road program. In conjunction with the agency's 15-minute movie, "Serving the Sixties," the engineers discussed the program and answered questions on panel shows. Assistant Chief Engineer D. B. Fugate in a taped interview answered specific questions about highway planning in the Norfolk area.

Eimco officials move

■ Wayne L. Dowdey, vice president of sales, and Berne A. Schepman, vice president of the Process Engineers division of The Eimco Corp., have moved to the Salt Lake City headquarters of the construction and mining equipment firm.

Maintenance Dept.

Starting diesel engine in cold weather? Try these suggestions

Diesel engines can be easily started in the coldest weather if the correct procedure is followed carefully. Yale & Towne's Trojan Division engineers offer these suggestions for effective starting of your diesel engines:

1. Keep the engine in good operating condition. The highest possible compression pressures and temperatures demand good valve and piston-ring seating. Also, clean injector tips assure proper atomizing of fuel and even combustion.

2. Low temperatures reduce battery output, so a peak charge will give the greatest possible cranking power.

3. Use clean diesel fuel No. 1 or No. 2, and drain water from the bottom of the tank periodically to prevent fuel-line freeze-ups. Tighten all fuel-line connections to prevent air locks.

Aerosol-type ether kit with replaceable supply tank. With prudent use, one tank holds a season's supply.

4. If your engine has glow plugs, use them according to instructions or use an ether-base fluid sprayed into the air intake. Be cautious when using ether-base fluids, since an excess of this fuel will cause extremely high cylinder pressures and could result in serious engine damage not covered by warranty. Some Cummins diesels have the glow plug mounted in the air intake manifold. Never use ether and an intake-mounted glow plug at the same time, since the glow plug will ignite the ether in the manifold and explode.

5. If shelter is available for your unit, use it; it will always improve starting conditions to some degree.

6. Use the proper grade of engine oil that is recommended by the engine manufacturers for the temperature conditions expected. Thinner oils take less cranking power in severe cold.

To start the engine using the ether-base fluid, spray the fluid into the air intake and crank the engine immediately until it starts. With glow plugs, preheat the plugs 20 to 30 seconds before spraying fuel on them and then begin cranking, keeping the glow plugs heated, until the engine starts. Once the engine is running, hold a moderate speed until oil pressure is normal and the engine runs smoothly. Now begin moving the machine and operating it moderately for the quickest possible warm-up. Try not to demand full power from the engine until the engine temperature is nearly normal.

For further tips on maintenance of its tractor shovels, write to Yale & Towne Mfg. Co., Trojan Division, Dept. C&E, Main St., Batavia, N. Y. Circle No. 250 on Request Card.

Vibrating screens need proper care—in time

Proper maintenance of vibrating screens is an often neglected item that can lead to costly plant downtime. Allis-Chalmers Mfg. Co. suggests the following checks as an aid to trouble-free screen performance.

Be certain the screen is installed for easy changing of screen surfaces, lubrication, and maintenance. An inaccessible screen leads to an unattended screen.

Check tension on fine screen cloth after the first 4 hours of operation, and on heavier cloth, after 8 hours. Make periodic tension checks until all the stretch is taken up. Check all bolts for tightness after the screen's first day of operation. Tighten bolts for a firm seat. High-strength bolts should be checked to specified torque values.

To get the expected life from bearings, keep the dust seals in good condition and follow recommended lubricating instructions. Use only the specified lubricant.

Use extreme care when greasing bearings or changing the oil. Wipe

Maintenance Dept.

grease fittings off with a clean cloth before applying grease gun. Keep the lubricant in a clean place. Use clean containers in order to avoid contamination.

During each 8 hours of operation, add a small amount of grease to each bearing of a grease-lubricated mechanism. On oil-lubricated mechanism, change oil every 300 hours of operation. Check periodically to see that proper oil level is maintained.

Don't increase a screen's operating speed without consulting the manufacturer. If bearing load is doubled, the expected bearing life is reduced to 1/10. Also, undue stress is placed on structural portions of the screen body.

Bearing trouble can be detected by a change in the sound of the mechanism. If this happens, shut down immediately and replace the bearing. Continued operation could ruin the seal plate and spacing collar.

When replacing bearings, use extreme care. Do this work in a clean shop. Keep the bearing absolutely clean after the wrappings have been removed.

For further maintenance information on its vibrating screens, crushers, etc., write to Allis-Chalmers Mfg. Co., Dept. C&E, Box 512, Milwaukee 1, Wis. Circle No. 248 on Request Card that is bound into this issue.

Fuel system needs special winter care

When temperatures start dropping in the fall, tractor owners are quick to protect cooling systems against an unexpected freeze. Caterpillar engineers point out, however, that there is another possible collection of water that is equally certain to shut down a tractor—ice blocking the fuel system.

Filling the fuel tank at the end of each day's work drives out all moisture-laden air and almost entirely eliminates water from condensation. In spite of regular evening refuelings, though, some moisture will get into the system. Since it is heavier than diesel fuel, it settles in two predictable places. Caterpillar-built tractors have drains in those two spots for removing water.

The first is at the base of the fuel tank. In warm weather, it is recommended that water be drained from the fuel tank before starting the engine in the morning. In freezing weather, however, an owner takes a chance on a possible freeze-up by waiting until morning; instead, he should drain collected water from the fuel tank at the end of the day, after allowing the tractor to sit a while to give the water a chance to settle.

Moisture in tractor fuel systems can collect in low spots and, when weather turns cold, may freeze, shutting off the flow of fuel. To prevent delay, water should be drained from the fuel tank at the end of the work day.

The second moisture drain on Caterpillar fuel systems is at the base of the fuel filter housing, which contains a sump to trap any remaining moisture carried in the fuel. When the temperature is below freezing, trapped water in the filter housing should be drained each day before the operator goes home at night.

For further facts about winter maintenance of Caterpillar equipment, write to Caterpillar Tractor Co., Dept. C&E, Peoria, Ill. Circle No. 241 on Request Card.

Freak accident caused pump-bearing failures

A user of centrifugal pumps was having a series of ball-bearing failures on pumps and other equipment. In each case an exhaustive study was made to determine the cause, yet no reason could be found for the failure.

One day the company's electrical engineer observed a welder attach his ground to the discharge of a centrifugal pump. When the welder finished, the electrical engineer had the pump dismantled (the pump not having been running during the entire episode). Examination of the ball bearings brought to light two burned spots on one of the bearings, which indicated that the current had arced across the ball race. This damage to the ball bearing would have developed into a bearing failure in a short time.

Positive instructions to welders not to attach their grounds to any equipment, piping, or structural steel have

now been issued. As a result, no further bearing failures have developed.

For more maintenance tips on pumps, write to Goulds Pumps, Inc., Dept. C&E, Seneca Falls, N. Y. Circle No. 247 on Request Card.

Tire-chain hardfacing extends chain life

Contractors and other users of construction equipment who equip their graders and other rigs with tire chains for winter work have found that hardfacing will extend the life of these chains almost indefinitely. The application of hard metal can be repeated as often as necessary, if chains are not worn excessively. And hardfacing costs are generally less than half the cost of new chains.

Close-up of hardfaced tire chains after several weeks' use. Note that hardfacing is still evident; wear is negligible.

Tire chains can be hardfaced with the oxyacetylene or the electric-arc process. The chains should first be used for a while to determine the wear pattern, but it is important that they be removed before too much metal is lost and the links weakened.

When hardfacing is done by torch, the links should be laid on a steel plate ½ inch apart. One drop of Bare Stoody Borod (fine mesh particles of tungsten carbide) applied to each worn area will increase the service life anywhere from three to seven times, this manufacturer reports.

For further information on hardfacing of tire chains, write to Stoody Co., Dept. C&E, 11904 E. Slauson Ave., Whittier, Calif. Circle No. 242 on Request Card.

Proper maintenance of wire rope a money saver

One of the most successful methods of lubricating—and thus properly maintaining—wire rope involves automatic or semiautomatic mist applications of small amounts of a light lubricating oil—just enough to keep the rope damp.

Protection against corrosion as well as abrasion is gained. An adequate oil film minimizes internal friction in the rope and at the same time cushions the wear between operating sheaves and the rope itself. Proper lubrication adds a safety bonus, because a light oil usually keeps the rope cleaner.

Complete information on a lubricating system for many types of wire-rope installations is available from the wire-rope engineering department of John A. Roebling's Sons Division, Colorado Fuel & Iron Corp., Dept. C&E, 640 S. Broad St., Trenton 2, N. J. Circle No. 243 on Request Card.

Hardsurfacing cuts maintenance 98 per cent

The pinion drive gear shown has been hardsurfaced with Colmonoy No. 6 rod. Used in a Galion asphalt-paving roller, it is still in good condition following its 5th year of service. Through use of hardsurfacing, service life of the steel gear has been improved at least 500 per cent, while maintenance costs have been cut

Maintenance Dept.

more than 98 per cent, the contractor reports.

Replacement costs have been cut by reclaiming the worn pinion gear with 3/16-inch-diameter Colmonoy No. 6 rod, applied to tooth surfaces by oxy-acetylene welding. Much of this cost saving is attributed to the smoothness with which the hardsurfacing rod can be applied. It requires no finish machining, and it is put into service in the "as welded" condition.

For further information on hardsurfacing as an economical maintenance device, write to Wall Colmonoy Corp., Dept. C&E, 19345 John R. St., Detroit 3, Mich. Circle No. 244 on Request Card that is bound into this issue.

Manufacturer's hints on chain-drive care

Periodic maintenance of chain drives can save the contractor costly downtime, expensive repairs, and untimely replacements on his chain-driven equipment. The Morse Chain Co. offers these suggestions to users of such equipment:

Check the oil level in pump-lubricated drives often enough so that it never falls below the minimum level. With bath lubrication it is important to check oil level frequently, since bath lubrication is effective only within narrower limits of oil level.

Change oil at least once a year, or as often as it begins to discolor or appear contaminated. At the time of each change, clean the case and reservoir of all sediment and flush the chain with kerosene.

At the time of each oil change make a thorough inspection of chain, sprockets, shaft seals, seal pockets, pocket drain holes, piping, pump, motor or pump drive, and the spraybar orifices. Check alignment and sag at this time and make corrections if necessary. If oil is not changed more than once a year, it is wise to inspect the drive at least three times a year in order to detect and arrest trouble before it can develop seriously.

For additional information on chain-drive installation, maintenance, and repair, write to the Morse Chain Co., division of Borg-Warner Corp., Dept. C&E, 7601 Central Ave., Detroit 10, Mich. Circle No. 245 on Request Card.

Axle shaft failures and how to prevent their occurrence

Some of the more common rear-axle shaft failures and their prevention are described as follows by the U. S. Axle Co.:

Shaft weariness failures will show lengthwise cracks running with the grain of the metal. The final break usually shows a splintered and woody appearance. Be sure vehicles are not

overloaded, that correct speeds are used, and that all other good operating practices are followed.

When shock load applied to the axle shaft exceeds the load capacity of the axle shaft, splines will twist and may give way at any time during normal operation. Check loads and speeds over rough roads, and employ proper driving techniques to stop recurring breakdowns. Drivers should be instructed not to drop-in the clutch when the engine is racing.

When axle housing is bent, a progressive break will develop at the outer diameter and will work toward the center until complete failure results. Sprung axle housings usually develop from an accident, from vehicle overloading, or from shock load impact. Alignment should be inspected periodically, and axle shafts examined after a road mishap.

A clean break at the flanged end is caused by a loose wheel hub's off-center motion. Check wheel bearing adjustment, replace worn bearings, and make a recheck of the bearings periodically.

Twisting failures resulting in final breaks usually occur at the spline end. Radial cracks caused by this type of failure usually start at the bottom of the spline and run toward the center of the axle shaft. Handle heavy loads very carefully, avoid clutch grabbing or catching of the vehicle on grades after it has started rolling backward, and avoid the use of propeller-shaft emergency brakes.

For more details on preventive maintenance of axle shafts, write to The U. S. Axle Co., Inc., Dept. C&E, Water St., Pottstown, Pa. Circle No. 240 on Request Card that is bound into this issue.

With every kind of machinery, the best maintenance is preventive maintenance. Costly hours of downtime can be avoided with regular checks of likely trouble spots.

Carelessness can kill fork truck; here are 12 service tips for users

Carelessness in servicing and maintaining fork trucks can be a costly item in the owner's operating costs. Clark Equipment Co. offers these points as guards against maintenance errors:

Be consistent about following the manufacturer's suggestions for lubrication, with regard both to the type of lube to be used and the frequency of lubrication.

When filling the gas tank, use a can that's used for gasoline only, not water or oil. And make sure it's clean and dry; dirt in the gas tank will cause more harm than water.

Use a mobile crane, chain lift, or some such device to secure the upright when the tilt cylinders are removed for inspection.

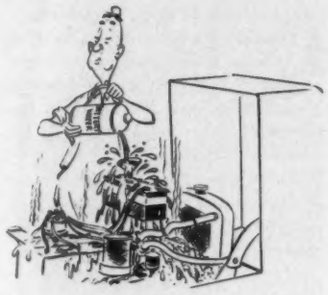
Clean rubber parts in denatured alcohol or some other nonmineral solvent.

Always use crocus cloth to clean cylinders of pressure marks and discolorations.

When the engine overheats, do not add water until the engine has cooled. Then start the engine and add water slowly.

Never start the engine when the cooling system is frozen. Tow the truck to a warm building and let it thaw completely.

Let the truck, or at least the battery, warm up before adding battery water in very cold weather.



Fill batteries with water only to the level indicated inside the case by the manufacturer of the equipment.

For smooth and reliable performance it is of utmost importance that proper point gap be maintained. (For measurement, a wire feeler gage is more accurate than a flat gage.)

Never get an ignition coil wet. Use an air blast to clean out dust.

Periodic inspection will indicate whether tilt cylinders are functioning equally. Deviations should be corrected immediately.

For further information on fork trucks and their maintenance, write to Clark Equipment Co., Dept. C&E, P. O. Box 31, Battle Creek, Mich. Circle No. 246 on Request Card that is bound into this issue.

Maintenance Dept.

Preventive maintenance is key to good performance of masonry saws

Preventive maintenance of masonry saws means better performance of the tool and substantial savings.

Today's masonry-saw motors are very powerful and will develop 6 horsepower or more during cutting. This requires a lot of "juice."

The worst enemy of electric motors is starvation due to an insufficient supply of electricity. Cables that are too small, poor connections, insufficient sizes of plugs and switches, corroded switch terminals—all combine to introduce barriers into the circuit.

The right collar size (3¾-inch-diameter for 14-inch-diameter blade) is very important. If collars are worn down, they can no longer support the blade properly.

Diamond blades too hard for the material may become dull and start to lead off. A few cuts through a fire brick or a heavy concrete block will dress the blade and restore its cutting properties.

A series of three or four shallow passes through the material, rather than a single cut to the full depth,

will help to keep the blade open.

Proper flow of water is vital to the operation of diamond blades and wet-cutting abrasive blades. Both electric and belt-driven water pumps are widely used. Clean water is a major factor for good life of either type.

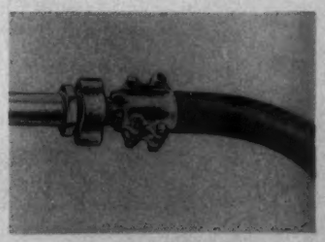
More complete information on maintenance of masonry saws may be had by writing Clipper Mfg. Co., Dept. C&E, Box 453, Kansas City 8, Mo. Circle No. 249 on Request Card.

Here's check list for steam hose use

Engineers of The Gates Rubber Co. offer these maintenance and safety rules when using steam hose.

1. Select the correct hose for the job. Rated working pressures and temperatures must not be exceeded.
2. Use proper couplings. Interlocking, clamp-type couplings are best because they can be tightened.
3. Use pipe between steam generator and saturated steam hose to protect the hose from local superheat conditions.
4. Avoid sharp bends in hose.
5. Protect hose from crushing by trucks and heavy machinery.
6. Inspect hose frequently. Recognize danger signs which precede hose failure, such as cover deterioration or blisters, restricted or brittle tube, or leaking steam.
7. Wear safety clothing when using steam hose—safety glasses, gloves, rubber boots, rubber apron reaching below the boot tops.
8. Grasp hose firmly at or near the nozzle to keep the hose from whipping.
9. Turn steam on and off at the source rather than the nozzle. Never leave steam hose under static pressure unnecessarily.
10. When turning on steam, point nozzle at the floor until steam flow is adjusted.
11. When using a steam-water mixture, always turn on the water first, then the steam. To cease operation, shut off steam first, then the water.
12. Steam hose should not be used to carry other materials and then returned to steam service.
13. Be sure hose is grounded when it is used to clean tanks which have contained combustible materials.
14. Drain hose and wipe the cover dry after use. Store hose in a cool, dry place when not in use. Store flat or on a large radius wall bracket. Never hang over a nail or hook.

For additional information about proper maintenance of hose used in construction, write to the Gates Rubber Co., Dept. C&E, 999 S. Broadway, Denver 17, Colo. Circle No. 239 on Request Card.



Metal pipe between source of steam and steam hose protects hose. Note interlocking, clamp-type couplings.

Maintenance Literature—

To obtain free copies of any of the literature described in this section, circle the designated number on the Request Card.

Fleet maintenance record—Literature describing the Wix preventive-maintenance record, in loose-leaf binder, for construction fleets. The Wix system employs a basic survey for each piece of equipment.
Wix Corp., Dept. C&E, Gastonia, N. C. **No. 181.**

Pumps—Handy booklet on the maintenance of all makes of centrifugal pumps. Includes chart of common pump ills—symptoms, causes, proven remedies. Also contains maintenance timetable.
Allis-Chalmers, Dept. C&E, Box 512, Milwaukee, Wis. **No. 174.**

Loader—Maintenance data on Eimco excavators. Case-history type of story presented in comic-book style.
Eimco Corp., Dept. C&E, 634 South 4th West St., Salt Lake City 10, Utah. **No. 170.**

Weldments—Literature offering instructions and welding tips useful in the repair and rebuilding of worn parts.
American Brake Shoe Co., American Manganese Steel Division, Dept. C&E, Dept. A, 389 E. 14th St., Chicago Heights, Ill. **No. 144.**

Metal-surface protection—Illustrated folder on the Truscon corrosion-control systems for primary protection and preventive maintenance of metal surfaces. Discusses the special benefits of each coating offered and includes application instructions.
Truscon Laboratories, Dept. C&E, 1700 Caniff, Detroit 11, Mich. **No. 150.**

Protective cold coating—Folder describing Bitumastic No. 50, an extra-heavy, thixotropic coating for the protection of steel structures and equipment exposed to severe corrosion environments. According to the manufacturer, Bitumastic No. 50 is also effective protection for underground foundations of reinforced concrete, masonry, or brick. Application data included.
Koppers Co., Inc., Dept. C&E, Koppers Bldg., Pittsburgh 19, Pa. **No. 151.**

Compressors—Instructions for operation and maintenance of Blue Brute rotary portable 2-stage compressors rated at 125, 210, 315, 365, and 600 cfm. Well illustrated with drawings, diagrams, and photographs.
Worthington Corp., Dept. C&E, Harrison, N. J. **No. 141.**

Roller chain—Literature on Tul-Flex roller chain for heavy-construction machinery. Illustrated; includes dimensional data and price information. Folder No. 2600TF.
Diamond Chain Co., Inc., Dept. C&E, 402 Kentucky Ave., Indianapolis 7, Ind. **No. 142.**

Maintenance Literature

Metal testing—Brochure describing four Magnaflux portable test kits for detection of all cracks open to the surface in weldments and steel or iron castings. Lists such benefits as reduced setup and application time, and ability to work in testing complex shapes. Photographs.

Magnaflux Corp., Dept. C&E, 7300 W. Lawrence Ave., Chicago 31, Ill. **No. 158.**

Painting equipment—Literature on DeVilbiss maintenance painting equipment. Describes and illustrates several types of spray equipment. Specifications included.

DeVilbiss Co., Dept. C&E, 300 Phillips Ave., Toledo 1, Ohio. **No. 159.**

Tire chains—Folder on Ruggo tire chains said to snap on or off quickly and with ease. The chains are available for trucks, graders, tractors, snowplows, and other heavy-duty equipment.

The Thomas Co., Dept. C&E, 3517 Raleigh Ave. S., Minneapolis 16, Minn. **No. 160.**

Rock drill steels—Humorously illustrated, 32-page handbook covering the care and handling of rock drill steels.

Atlas Copco, Inc., Dept. C&E, 545 Fifth Ave., New York 17, N. Y. **No. 164.**

Winches—Operating instructions and service manual for the Braden CL series constant-load winches. Photographs and a variety of drawings and diagrams.

Braden Winch, division of Nautec Corp., Box 574, Broken Arrow, Okla. **No. 165.**

Rubber repair—Literature on Devcon R, a self-curing, nonshrinking compound for repair of conveyor belting, hose, and other rubber products. Describes two types: putty and liquid. Lists physical properties, and gives application data.

Devcon Corp., Dept. C&E, Danvers, Mass. **No. 166.**

Scaffolding—Folder on the use of Beaver-Advance rolling scaffold towers and work stages for a variety of interior and exterior maintenance work. Stresses simple parts assembly for any width or height.

Beaver-Advance Corp., Dept. C&E, Box 792, Ellwood City, Pa. **No. 167.**

Pumps—Check-in pad containing a comprehensive list of points to be checked when a McGowan or other make of self-priming pump comes off the job. By answering the questions and following the simple tests, each pump can be quickly checked for any danger signs indicating improper use.

McGowan Pumps, division of Leyman Mfg. Corp., Dept. C&E, 10944 Kenwood Road, Cincinnati 42, Ohio. **No. 168.**

Lubricants—Illustrated folder on Keystone specialized lubricants for a wide variety of heavy construction machinery. Bulletin BU-58.

Keystone Lubricating Co., Dept. C&E, 21st and Lippincott Sts., Philadelphia 32, Pa. **No. 175.**

Diesel starting system—Folder on the Turner Quick-Start, a system for starting diesels in cold weather. Describes three units designed for any starting requirement. Illustrations.

Turner Corp., Dept. C&E, 821 Park Ave., Sycamore, Ill. **No. 139.**

Patching, anchoring compound—Literature on Stonfil, a compound for patching ruts and holes, as well as for anchoring bolts, in concrete. According to the manufacturer, Stonfil can be used in freezing temperatures and cures in less than 30 minutes.

Stonhard Co., Dept. C&E, 401 N. Broad St., Philadelphia 8, Pa. **No. 143.**

Equipment cleaners—Brochure on Clayton Models 280 and CS-628 heavy-duty steam and hydraulic cleaners. Available in either gasoline or oil-fired models, these units are offered in stationary, portable, skid-mounted, and trailer-mounted models. Complete specifications.

Clayton Mfg. Co., Dept. C&E, 401 North Temple City Blvd., El Monte, Calif. **No. 178.**

Tooth installation, maintenance—Handy guide to the proper assembly, installation, and maintenance of solid teeth, adapters, points, pins, etc.

Esco Corp., Dept. C&E, 2141 N. W. 25th Ave., Portland 10, Ore. **No. 169.**

Grouser bars—Illustrated folder on Grip-Lug crawler-tractor grouser bars. Easy installation and long service are among the features stressed. Form No. SA-021.

Allied Steel & Tractor Products, Inc., Dept. C&E, 7835 Broadway, Cleveland 5, Ohio. **No. 176.**

Welding wires, rods—Comprehensive catalog of Oxweld electric welding wires and rods. Lists available forms, sizes, packages, and chemical compositions. Also recommended welding processes. Catalog F-1486.

Linde Co., division of Union Carbide Corp., Dept. C&E, 270 Park Ave., New York 17, N. Y. **No. 147.**

Boom pendants, extenders—Bulletin on Roebling swaged-socket boom pendants and extenders for draglines, cranes, shovels. Discusses such benefits as greater safety and easy installation, and is illustrated with photographs and drawings. Specifications. Bulletin A-951.

John A. Roebling's Sons, division of Colorado Fuel & Iron Corp., Dept. C&E, 640 S. Broad St., Trenton 2, N. J. **No. 179.**

Jacks—Service and maintenance instructions for Simplex ratchet lowering lever jacks. Text well illustrated with drawings. Form No. 212.

Templeton, Kenly & Co., Dept.

For more facts, use Request Card and circle No. 341 →

Maintenance Literature

(*Continued from preceding page*)

C&E, 16th St. and Gardner Road, Broadview, Ill. **No. 177.**

Spreader—Bulletin on the Hydro-Spreader, a tailgate spreader featuring quick-disconnect mounting pins. Discusses the benefits of the unit in both ice control and seal coating. Photographs and specifications. Bulletin H-4.

Central Engineering Co., Inc., Dept. C&E, 4429 W. State St., Milwaukee 8, Wis. **No. 180.**

Telescopic hoist—Guide for the operation and service of Perfection telescopic hoists. Includes diagrams and helpful trouble-shooting tips.

Perfection Steel Body Co., Dept. C&E, Galion, Ohio. **No. 138.**

Differentials—Service maintenance manual on Detroit Automotive NoSpin differentials. Discusses assembly, removal, and inspection.

Detroit Automotive Products Corp., Dept. C&E, 8701 Grinnell Ave., Detroit 13, Mich. **No. 140.**

Excavators—Maintenance guide for Caterpillar Traxcavators. Discusses Models 977, 955, and 933. Thorough coverage; well illustrated.

Caterpillar Tractor Co., Dept. C&E, Peoria, Ill. **No. 145.**

Crushers—Handbook on how to secure maximum efficiency from Symons cone crushers. Discusses some of the common problems and faults encountered in crusher operation. Photographs. Bulletin 300.

Nordberg Mfg. Co., Dept. C&E, 3073 S. Chase Ave., Milwaukee, Wis. **No. 146.**

"And what's so frightening about shoving a bag of explosives in a snake hole?"

Service and parts trailers form windbreaks on either side of this shelter for lubricating scrapers. Heated grease trailer is at left. Men enter the trailers through side doors from the inside shelter.

Maintenance

Winter care keeps graders on the move

Equipment maintenance on C. F. Replogle Co.'s wintertime grading job (see "Earthmoving at 10 Below," page 92) called for careful planning and rigid adherence to a schedule—particularly in the area of preventive maintenance.

The two work shifts on this earthmoving project were scheduled to give mechanics and oilers 4 hours of daylight during which to service the rigs. One work shift ran from 6 a.m. to 2:30 p.m.; the other from 6:30 p.m. to 3 a.m. All the equipment was thus available for maintenance or repair during the 4 afternoon hours. Among advantages of this daylight maintenance period was the fact that service crews could more easily spot fatigue cracks in the steel.

Lubrication shelter

A simple but ingenious shelter protected the oilers from the weather while they were fueling and lubricating the scrapers. The shelter consisted of a 40 × 20-foot wooden V-truss roof supported by tall timber posts, with two trailer vans forming the sides. The ends were normally left open to permit a scraper to enter and leave. The shelter could be completely enclosed, however, by drawing canvas curtains across the ends. Natural light entered through transparent plastic windows located between the roof and the tops of the trailers.

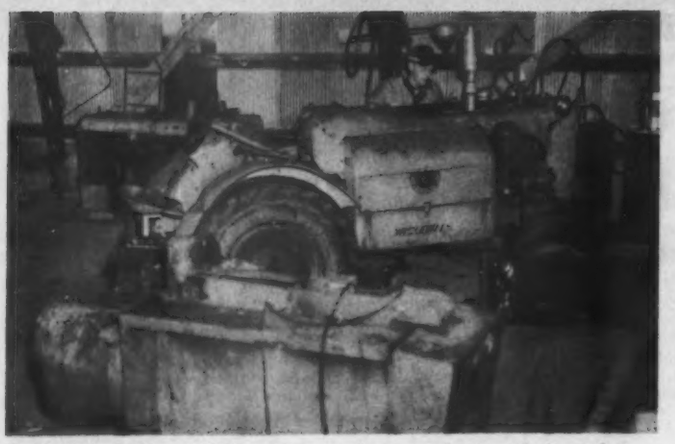
One of the trailers contained heated grease and lubrication equipment. The other was primarily for storage. In the grease trailer, five 55-gallon grease drums were heated from below by ductwork from an oil heater. The oil heater was located in an enclosed area on the ground beneath the trailer. Each drum was placed over a heated hole in the floor. Additional drums were stored at the rear of the trailer.

Heat lubricant

In order that scrapers could be greased from the opposite side, a 1½-inch steel grease line ran under the ground from the heated trailer to a riser near the unheated trailer. The line was wrapped with electric heating wire and insulated to keep the grease warm.

When available, two Graco-equipped enclosed lube trucks supplemented the greasing equipment in

For more facts, use Request Card and circle No. 343



Inside Replogle's heated field maintenance shop, a mechanic works in comfort on a LeRoi Tractair. The Silent Glow blower-type oil heater in foreground heats the shop when the batch plant is not operating.

Working during the 4-hour afternoon downtime period between morning and evening work shifts, mechanics replace a cutting edge on this D9 dozer. Cutting torch equipment is carried in the mechanic's Ford pickup.

(Continued from preceding page)

the trailer. With the trucks backed up close to the trailer, the oilers moved in on a scraper. An 8,000-gallon diesel tank was stationed near the unheated trailer for fueling the scrapers.

When it wasn't possible to grease equipment during the 4 hours of downtime, the equipment was pulled off the line and greased.

Major repairs to equipment were made in the 36 × 50-foot, portable steel shop building in the field-headquarters area. Located next to the contractor's batch plant, the building was heated from the exhaust flue of a Bros 65-hp boiler that supplied steam to heat the aggregates. When the batch plant was not in operation, the building was heated by a Silent Glow blower-type oil heater.

An equipment superintendent was responsible for the care of the 50 major pieces of equipment on this job. Under his supervision were six oilers, two engine mechanics, and eight general mechanics. THE END

Clear Visqueen plastic film was fastened over wedge-shaped wooden frames and placed against windowless areas of the Fairview, Pa., Methodist Church during winter work. Frames were easily moved to make way for ready-mix concrete trucks.

Contractors beat cold with plastic film

■ Two building contractors—one in Indiana and one in Pennsylvania—were able to keep work moving last winter by different applications of plastic film.

The Bar-Tel Co. of Muncie, Ind., built a dome of clear Visqueen polyethylene film to protect concrete slabs and aid in curing. First, 2 × 4 plates were anchored to the wall forms, and one edge of the film was secured to the plates with 2 × 2's. The film was then unrolled over the slab against the wind so that a "bubble" was blown up and away from the fresh concrete. The other side and the ends were secured, and the bubble was kept inflated by a 26-inch down-flow oil-fired furnace. A blower was used to keep the bubble at a height of about 2 feet at the center.

Manager Fred C. Bartel advises anyone trying this to leave a small opening in the bubble at the end opposite the furnace to prevent air pressure from building up too high and pulling the cover loose.

A bonus feature of this bubble is that the nailing strips can easily be lifted to allow a worker in with a troweling machine to finish the slab in a warm atmosphere.

The Pennsylvania project was the work of general contractor George E. Ottenl, who estimates that portable shields of Visqueen saved him three weeks during the building of the Fairview Methodist Church. Wedge-shaped wooden frames covered with panels of the plastic film were placed against window openings, and with heating units inside, crews kept going despite bad weather. The lightweight frames were easily moved aside for ready-mix trucks to deliver concrete.

About 16,000 square feet of film was used on this project. Most of it went into the enclosures, but black Visqueen film was also used under the slab as a moisture barrier.

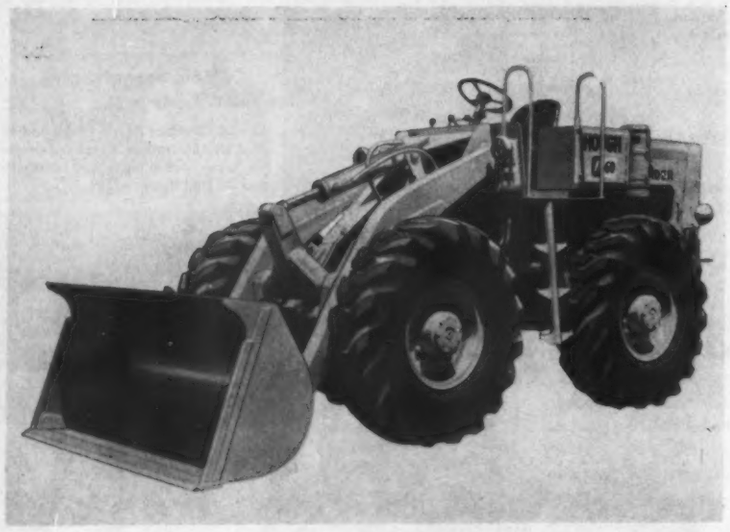
Elmer Ward of HRB dies

■ Elmer M. Ward, assistant director of the Highway Research Board for the past seven years, died late in August. He joined HRB in 1946 as engineer of maintenance and later served also as engineer of materials and construction.

Ward began his civil engineering career with the Iowa Highway Commission. From 1941 to 1946 he served with the U. S. Army Corps of Engineers, helping to develop methods and equipment for rapid construction of roads in desert terrain.

PRODUCT PARADE

For further information on any of the products described in the following section, circle the designated number on the Request Card.



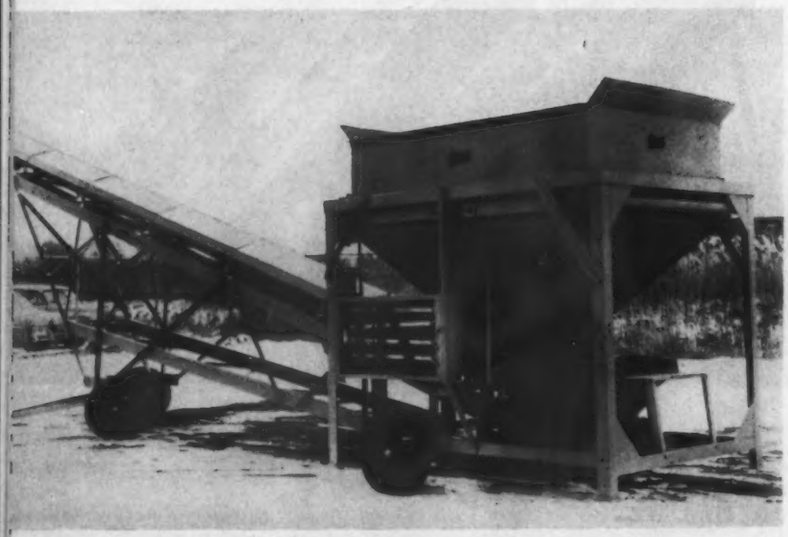
Add new machines to tractor-shovel line

The Frank G. Hough Co. announces two new 4-wheel-drive, rubber-tire, front-end loaders—the Model H-60 with 1¾-yard-capacity, and the Model H-70 series C with 2½-yard-capacity bucket.

Extra-strong, box-section boom arms are located ahead of the operator's compartment for maximum safety.

The H-60 offers a choice of gasoline or diesel power, with engines developing 110 and 107 horsepower, respectively. The H-70 series C is powered by a 148-hp diesel engine.

The Frank G. Hough Co., Dept. C&E, 726 7th Ave., Libertyville, Ill. Circle No. 185 on Request Card.



New batch plant has 6-cubic-yard capacity

Aeroil announces a new 6-yard portable batch plant.

The weigh batcher is made of Man Ten abrasion-resistant steel for longer life. The unit has a beam scale as standard equipment but can be equipped with a dial scale as optional.

A 24 × 40-inch belt conveyor is standard equipment complete with a belt wiper and discharge hood. The conveyor is driven by a gasoline engine.

Completely portable, the plant is ideal for location on the job site, according to the manufacturer.

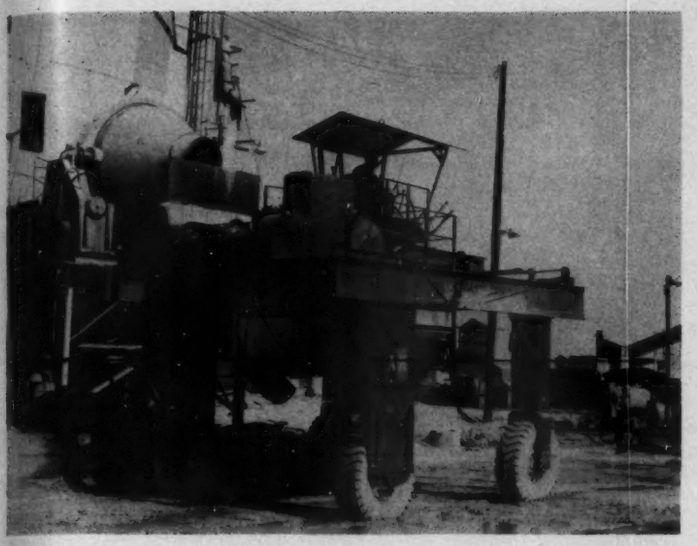
Aeroil Products Co., Inc., Dept. C&E, 69 Wesley St., South Hackensack, N. J. Circle No. 184 on Request Card.

Truck line is restyled; now has 198 models

Lower hood lines for improved road visibility, restyled grille, direction signals included as standard equipment on most models, single headlamps for lower maintenance costs on all but a few models, are highlight features of Chevrolet's 1962 trucks.

The truck line has been expanded to 198 models, ranging from light-duty Corvair 95 pick-up trucks to big tandem-axle units. A 4-cylinder medium-duty diesel and two larger, more powerful V-8's in medium and heavy-duty models are also offered.

General Motors Corp., Chevrolet Motor Division, Dept. C&E, General Motors Bldg., Detroit 2, Mich. Circle No. 137 on Request Card.



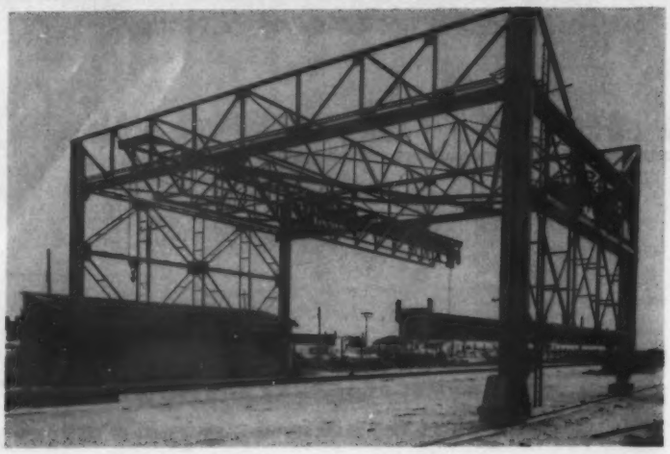
Big bridge trolley crane for prestress operations

The Strad-Krane, a mobile bridge trolley crane designed to handle, position, and transport prestressed-concrete members, is available from the Silent Hoist & Crane Co., Inc.

This machine, which also handles buckets for placing concrete into forms, has a standard capacity of 25 tons, and features a traveling speed of 10 mph, forward and reverse. Inside clearance is 12 feet high and approximately 12 feet wide.

The unit is powered by a 6-cylinder gasoline or diesel engine.

Silent Hoist & Crane Co., Dept. C&E, 841–877 63rd St., Brooklyn 20, N. Y. Circle No. 129 on Request Card.



Designed for use in prestressed yard operations, this hydraulic gantry crane has a lifting capacity of 20 tons. Maximum speed along rails while loaded is 150 fpm. According to the manufacturer, this unit can travel with three separate prestressed members. **Dixie Form & Steel Co.,** Dept. C&E, P. O. Box 6387, Alamo Heights Sta., San Antonio 9, Texas. Circle No. 182 on Request Card.

New mobile radio set fits under the dash

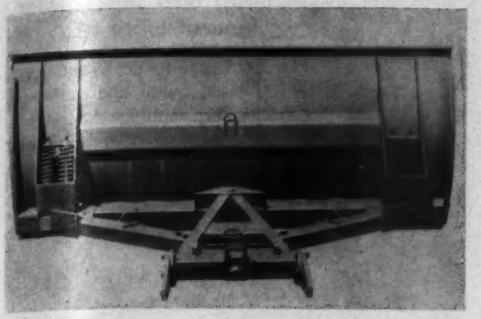
A new VHF FM 2-way mobile radio set is announced by Aeronautical Electronics, Inc.

This 15-watt set in the Slimline series weighs 8 pounds 10 ounces, and is less than 5 inches high. It fits easily under the dashboard of any car or truck, according to the manufacturer.

Through the use of a "gated" final audio stage and a standby switch, the battery drain on 12 volts has been reduced to less than 3 amp for the receiver and 9 amp for full 15-watt output from the transmitter.

Although initially only for 12-volt operation, the new Slimline reportedly may be interchanged from vehicle to vehicle without regard to battery polarity since the proper connections are made external to the set in the power cable socket.

Aeronautical Electronics, Inc., Dept. C&E, P. O. Box 6527, Raleigh, N. C. Circle No. 96 on Request Card that is bound into this issue.



This rear view of the new Wausau reversible trip-blade snowplow shows the formed box section that serves as the main horizontal brace, six vertical ribs, and the double-flange top brace.

Announce new series of trip-blade plows

A new series of reversible trip-blade snowplows is announced by Wausau Iron Works.

Designed with the A-frame assembly on top of the reversing frame to permit ample road clearance and to provide additional leverage for straight-ahead push, the plow also features four heavy-duty self-cleaning, screw-adjustable compression springs. Two additional inner springs cushion shock and limit the trip of the entire moldboard to pass over obstructions without damage.

Each Wausau reversible trip-blade can be set at five different plowing positions: 35 to 42 degrees, right or left, plus center. Adjustable 6-position push plates permit the plow to conform to various truck-frame heights.

Wausau Iron Works, Dept. C&E, 738 S. 10th Ave., Wausau, Wis. Circle No. 58 on Request Card.

Tire pressure corrected while vehicle is moving

Pneumatic tires reportedly can be inflated, deflated, and continuously gaged while the vehicle is in motion, by means of a new central air-control system developed for fleet and off-highway equipment by A. Schrader's Sons, division of Scovill Mfg. Co., Inc.

Schrader points out that the system adds the ability to vary the operation of specialized equipment, such as a fixed-load compactor. By adjusting for a higher or lower tire pressure, the degree of soil compaction can be changed in seconds, and under the control of the driver.

A leakproof rotating joint located at each wheel hub provides a continuous connection between the tires and the compressor, storage-supply tank, gages, and controls. On vehicles equipped with air brakes, the present compressor may be used to supply both the brake tank and a tire air tank; when the system is installed on a vehicle that does not have air brakes, a small "pilot air tank" is required.

A. Schrader's Son, division of Scovill Mfg. Co., Inc., Dept. C&E, 470 Vanderbilt Ave., Brooklyn, N. Y. Circle No. 26 on Request Card.

The Ottawa LX backhoe features a 30-second couple said to work equally well on even and rough ground.

New hydraulic backhoe for wheel loaders

A quick-disconnect feature, 12-foot 6-inch digging depth, and a dirt ejector bucket are features of a new hydraulic backhoe announced by the Young Spring & Wire Corp. for use on Caterpillar wheel loaders.

Called the Ottawa LX backhoe, the unit fits Cat 922 and 944 wheel loaders, as well as the 933 Traxcavator. The quick-connect Hydra-Hitch reportedly allows the entire backhoe to be attached in 30 seconds by pushing one lever to engage two cone mounting pins and latching quick release. Coupling the quick-connect hydraulic lines completes the job. Reversing the process frees the loader. A second, standard model features mechanical attachment by one man in 15 minutes.

In addition to its 12-foot 6-inch digging depth, the Ottawa LX backhoe has an 8-foot 6-inch dump height, and 190-degree swing, right to left. Cushioning ports prevent "slamming" the boom at the limits of the swing. With no loss of speed, the LX can exert 7,000 pounds force at the bucket cutting edge, according to the manufacturer.

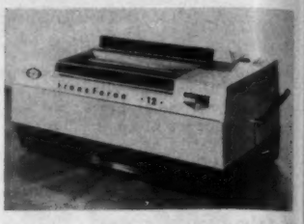
Three quick-change buckets with 14 to 36-inch widths and ¾-inch edges are available.

Young Spring & Wire Corp., Equipment Division, Dept. C&E, 500 Lehman Ave., Bowling Green, Ohio. Circle No. 49 on Request Card.

Compact new photocopier for general office use

A photocopier for general office use, weighing 22 pounds and capable of handling material up to 12 inches in width, is announced by the Ozalid Division of the General Aniline & Film Corp.

Called the Transferon, the compact unit gives copies in seconds from



opaque or transparent originals in any length, printed on one or both sides. It plugs into any 110-volt ac 60 outlet.

Thirty-two ounces of pre-mixed developer are carried in a slip-in cartridge that eliminates developer mixing and prevents oxidation of the developer. When the machine is turned on, the developer automatically flows into the developing tray and returns to the airtight cartridge when the machine is turned off.

General Aniline & Film Corp., Ozalid Div., Dept. C&E, 526 Corliss Lane, Johnson City, N. Y. Circle No. 134 on Request Card.

Screw anchor features increased holding power

A new type of screw anchor, installed with a power digger in a few minutes, is said to provide more positive holding power because of minimized earth disturbance during installation and increased helix diameters. Called PowerDrive, it is avail-

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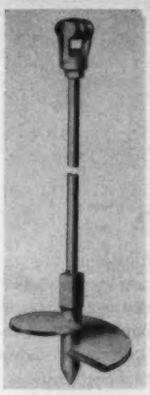


able from Hubbard & Co.

A simple wrench, also available from the manufacturer, transmits the torque from the power digger directly to the hub of the anchor wing.

Hubbard & Co., Dept. C&E, Advertising Dept., Box 61, Lyons, Ill. Circle No. 79 on Request Card.

Tubing prevents bond over prestress strands

Aeroflex plastic tubing, designed to prevent bond in pretensioned, prestressed-concrete structures, is now available in 7/16-inch diameter for use with 7/16 and ½-inch-diameter steel strands.

Aeroflex is an open, overlapping tube with the overlap length about one-half a circumference. The tubing is easily and speedily applied by pushing the opened tube against the wire while walking along the strand. According to the manufacturer, the flexibility of Aeroflex makes the tube self-closing around the strand.

Anchor Plastics Co., Inc., Dept. C&E, 36-36 36th St., Long Island City 6, N. Y. Circle No. 31 on Request Card.

Trench-backfill conveyor is versatile machine

A new trench-backfill conveyor said to allow simultaneous excavating, backfilling, and pipe laying, and to substantially increase the pace of sewer construction work, is announced by the Kolman Mfg. Co.

Called Model 161, this machine is shackled to the excavation machine with a rigid towbar. Spoils are cast from the dragline, shovel, or trencher directly into a casting hopper over the conveyor. Materials are then moved along the conveyor belt 50 feet, which allows pipe-laying crews ample time to complete work while spoils are being discharged over completed pipe sections.

The conveyor belt is available in 36 or 42-inch widths. The conveyor system is mounted on a 34-foot-wide axle that straddles the trench; hydraulic steering permits wheels to follow excavator on curving roads. The axle folds to 7-foot width for ready transport between jobs.

Kolman Mfg. Co. Dept. C&E, 4922 W. 12th St. Sioux Falls, S. Dak. Circle No. 37 on Request Card that is bound into this issue.

The rotary snowplow attachment on this Michigan Model 75A tractor-shovel has a 20-ton-per-minute capacity, and hurls snow up to 75 feet in distance. The 75A unit operates at speeds up to 26 miles per hour forward or reverse to provide maximum efficiency in this type of operation. The unit shown is owned and operated by the city of Cudahy, Wis. **Clark Equipment Co.**, Dept. C&E, P. O. Box 599, Benton Harbor, Mich. No. 162.

Offered for use with Cat No.'s 966 and 944 wheel loaders, the Omsteel snow wing is operated by two in-cab controls.

Snow wing available for wheel loaders

A snow wing for Caterpillar wheel loaders is offered by Omaha Steel Works.

The wing is operated by two in-cab controls. One raises and lowers the wing in level position; the other raises or lowers the outer end. Adjustment of the telescoping strut changes the angle of attack. A removable cutting edge is adjustable.

The wings are available for No.'s 966 and 944 wheel loaders. Many parts are interchangeable with the Omsteel wing for Caterpillar motor graders, the manufacturer states.

Omaha Steel Works, Dept. C&E, 609 S. 48th St., Omaha 6, Nebr. Circle No. 122 on Request Card.

New device available for foundation testing

A device that makes an accurate tally of the actual number of blows made by an automatic foundation drilling test unit is offered by the Durant Mfg. Co.

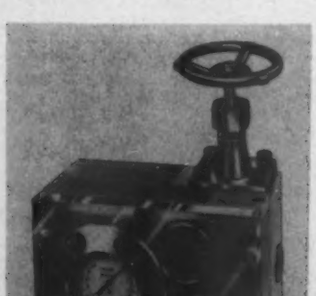
Designated Model 6-C-3 ratchet rotary counter, the unit is mounted directly on the testing machine, and is used to test ground for its ability to hold weight in construction.

Durant Mfg. Co., 1976 N. Buffum St., Dept. C&E, Milwaukee 1, Wis. Circle No. 121 on Request Card.

Device locates trouble in hydraulic systems

A compact, portable instrument that reportedly can pinpoint hydraulic-system problems in a matter of minutes is available from Schroeder Bros. Corp. for on-the-job use wherever hydraulics (up to 3,000 psi) are employed.

Weighing 20 pounds, this Schroeder Hydra-Sleuth incorporates flow, pressure, temperature gages, and a load valve for use in any position on hydraulic equipment.

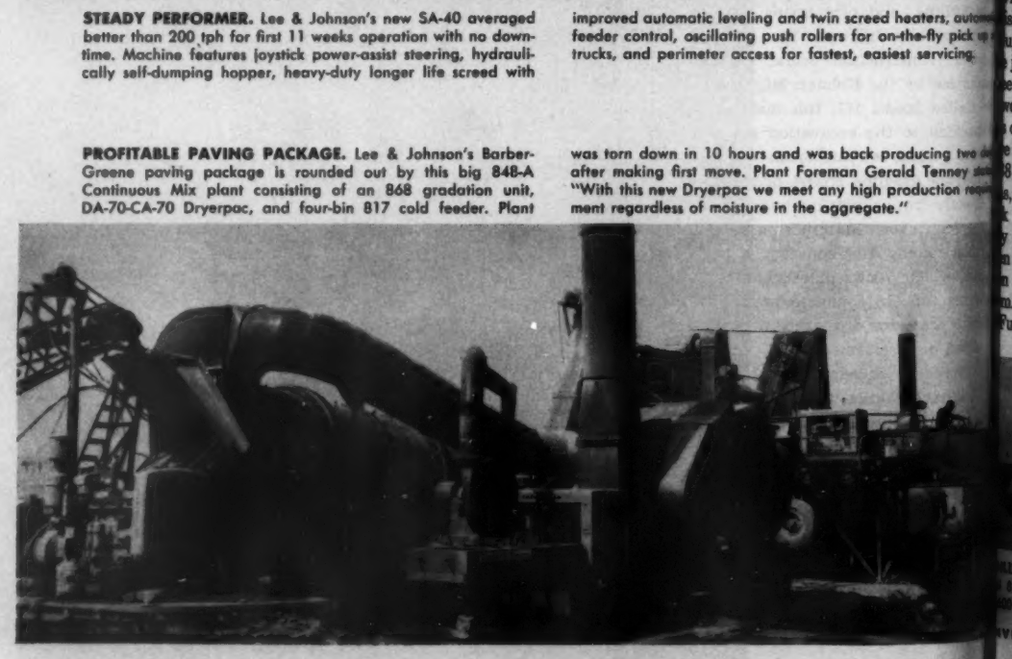


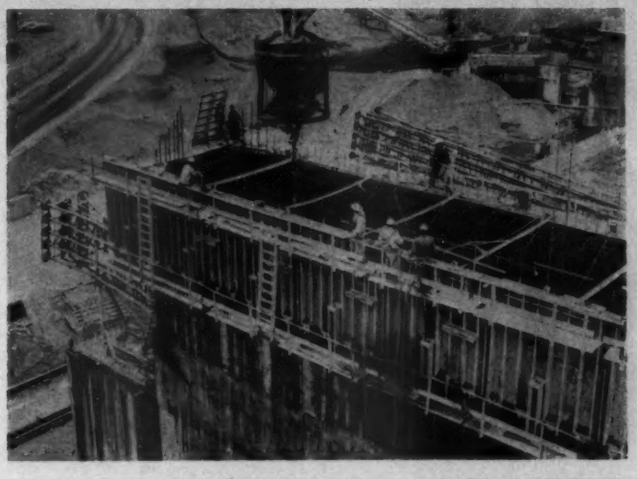
With the Hydra-Sleuth installed, hydraulic troubles show up as a drop-off in gpm on the flow gage, as working pressure is developed with the load valve. Trouble is then isolated to the pump valve or cylinder by taking flow, pressure, and temperature readings on various sections of the circuit.

Schroeder Bros. Co., Dept. C&E, Nichol Ave., Box 72, McKees Rocks, Pa. Circle No. 150 on Request Card.

STEADY PERFORMER. Lee & Johnson's new SA-40 averaged better than 200 tph for first 11 weeks operation with no downtime. Machine features joystick power-assist steering, hydraulically self-dumping hopper, heavy-duty longer life screed with improved automatic leveling and twin screed heaters, automatic feeder control, oscillating push rollers for on-the-fly pick up trucks, and perimeter access for fastest, easiest servicing.

PROFITABLE PAVING PACKAGE. Lee & Johnson's Barber-Greene paving package is rounded out by this big 848-A Continuous Mix plant consisting of an 868 gradation unit, DA-70-CA-70 Dryerpac, and four-bin 817 cold feeder. Plant was torn down in 10 hours and was back producing two days after making first move. Plant Foreman Gerald Tenney states: "With this new Dryerpac we meet any high production requirement regardless of moisture in the aggregate."



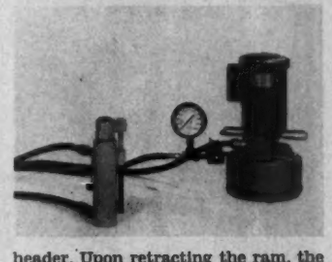


Steel forms, specially designed and fabricated for the Wanapum Power Development project by Blaw-Knox, are in use for the dam face, draft tube, and intake structure. The steel catwalk is an integral part of the form, and an important safety factor. **Blaw-Knox Co.,** 300 6th Avenue, Pittsburgh 22, Pa. Circle 107 on Request Card.

Two tensioning units are versatile, portable

Two tensioning units available from the Simms Engineering Co., the Models R15006–P10000–60 and R1512–P10000–60, are designed for versatility and portability.

The ram jacks against the strand vise and keeps it tight against the



header. Upon retracting the ram, the strand chuck is already locked in position.

There is a release valve in the high-pressure line so that the operator will not lose his line pressure when the pump valve is centered. It also gives the operator accurate control of the tensioning pressure.

Simms Engineering Co., Dept. C&E, 5301 W. Patterson Ave., Chicago 41, Ill. Circle No. 194 on Request Card.

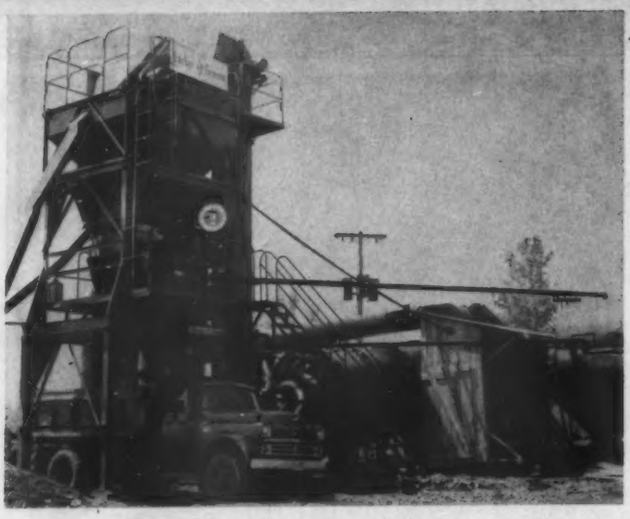
Offer hot-oil heaters for hot-mix plants

The Childers Mfg. Co. announces the Model E series circulating hot-oil heaters for use with both stationary and portable asphalt hot-mix plants and related storage heating, and for bulk-asphalt and road-oil heating.

The new models feature compact design and are fully automatically controlled with smaller control panels and zone-failure indicating lights. The burner is mounted on the combustion chamber door, which swings out for easy maintenance without any disconnects.

Offered in a wide range of output capacities and mountings, these heaters may be skid-mounted, trailer-mounted, or mounted on Childers all-in-one combination heater and storage tank trailers.

Childers Mfg. Co., Dept. C&E, Box 6185, Albuquerque, N. Mex. Circle No. 45 on Request Card.



A full line of plant components is available for use with Barber-Green's Model A-8 batch tower, which features high portability.

One-ton unit added to batch-tower line

Barber-Greene announces the availability of a new 2,000-pound asphalt batch tower.

Designated Model A-8, the unit's features include sectional design for quick, easy erection, hydraulically operated pugmill discharge gate, 11-ton total storage capacity, 4-bin design to meet all specifications, and a complete line of accessories.

Although designed to operate with the 5-foot-diameter Model DA-50 dryer, the A-8 may be used with smaller or larger Dryerpacs to meet unusual moisture conditions.

Barber-Greene Co., Dept. C&E, 400 N. Highland Ave., Aurora, Ill. Circle No. 17 on Request Card.

Announce new combination rotary, percussion drill

The Joy Mfg. Co. announces the Model RPD rotary and percussion drill.

According to the manufacturer, the drill is best suited for tunneling and other underground operations with holes 1¼ to 1¾ inches in diameter and up to 16 feet deep. Larger and deeper holes may be drilled in some formations.

Rotary cutting in the Joy RPD is provided by an independent rotation system that applies high torque to the bit through a variable-speed hydraulic motor and gear reduction.

The percussion action comes from a high-speed, free-piston percussion unit.

Torque, feed pressure, and hammering may be varied to meet drilling conditions, thus making possible higher drilling rates in mixed rock formations. The drills are equipped with automatic hose reels to keep air, oil, and water hoses out of the way at all times.

Drill maintenance is held to a bare minimum because of the simplicity of design, states the manufacturer.

Pressure and speed settings can be preset and easily altered for the type of rock drilling to be done. The operator has only the start and stop controls to work when the machines are at the face.

Joy Mfg. Co., Dept. C&E, Oliver Bldg., Pittsburgh 22, Pa. Circle No. 78 on Request Card.

A 1¼-yard bucket gives the new, improved Payloader H-30 some 25 per cent more capacity. Easier maintenance is another important feature.

Improvements announced for tractor shovel

The Frank G. Hough Co. announces a new, improved series B version of its Payloader Model H-30 4-wheel-drive tractor shovel.

This unit is now equipped with a 1¼-cubic-yard bucket. For safety, the boom arms are positioned ahead of, and away from, the operator. Ease of maintenance and accessibility have also been given extra attention. The simplified boom mechanism and single bucket-tilt cylinder are said to result in from 6 to 12 fewer pivot and grease points than other loaders. All bucket and lower boom arm pivot points are sealed against dust and dirt. The battery, instrument connections, fuel tank, and transmission can be serviced from ground level.

Dual foot-brake pedals give the operator a choice of braking with or without transmission engaged. Both axles are equipped with torque-proportioning differentials. When one wheel is capable of receiving more tractive efforts than the other on the same axle, it can automatically receive 38 per cent more torque, according to the manufacturer.

This new Payloader is available with either gasoline or diesel power.

The Frank G. Hough Co., Dept. C&E, 822 Seventh St., Libertyville, Ill. Circle No. 64 on Request Card that is bound into this issue.

Prestressed member for spans to 100 feet

A new precast, prestressed-concrete roof and floor decking member, described as a giant tee, for clear spans to 100 feet, is announced by the George Rackle & Sons Co.

The units can be provided in widths of 4 to 8 feet, with the depth of the single tee stem also variable from 18 to 36 inches.

Versatility of the new member is obtained by varying width, stem height, and number of prestress tendons.

The George Rackle & Sons Co., Dept. C&E, Newburg Station, Cleveland 5, Ohio. Circle No. 67 on Request Card.

Carbon-monoxide detector is simple to operate

A carbon-monoxide detector for areas where flueless heaters are used to keep concrete from freezing during winter months is announced by the Mine Safety Appliances Co.

Called the M-S-A Colorimetric CO tester, the unit is said to be simple to operate. It consists of a replaceable indicator tube, an aspirator bulb to draw air samples, and a revolving color scale.

To check for carbon monoxide in key areas, the operator breaks the sealed ends of the detector tube and inserts it in the holder. He squeezes the bulb and draws an air sample through the tube, which contains a silica gel impregnated with a silicomolybdate compound. The sample is controlled by a specially designed metering orifice.

When the sample passing through the tube contains CO, the yellow gel turns green—the more CO, the darker the shade of green. A color scale mounted directly beside the tube shows the percentage of CO matching the color of the silica gel.

Mine Safety Appliances Co., Dept. C&E, 201 N. Braddock Ave., Pittsburgh 8, Pa. Circle No. 153 on Request Card.

Longer, narrower, and deeper, the new Lull Hod Buggies have approximately a 7-cubic-foot capacity, yet take up less room on scaffolds.

Mortar-handling tank has improved design

The Lull Engineering Co., Inc., announces a new, improved mortar-handling tank called the Model 10-A high-lift Hod Buggy.

Main feature of the new design is the narrower, deeper, longer, 7-cubic-foot-capacity tank, which is said to be safer and easier to use because it takes up less room on scaffolds. This feature also reduces spillage and makes it possible for Hod Buggies to be lifted two at a time on standard Lull 7-B high-lift pallet forks—up to 30 and 40-foot heights. Another new feature is greater underclearance for easier pickup on pallet forks from either side.

Over-all dimensions of the new model are: length, 52½ inches; width, 23½ inches; and the height of the unit, 29½ inches.

The Lull Engineering Co., Inc., Dept. C&E, 3045 Highway 13, St. Paul 11, Minn. Circle No. 52 on Request Card.

The Earthripper 5000 is mounted on a ruggedly constructed carrier with a 6 × 4 rating of 33,500 pounds gvw or a 6 × 6 rating of 35,000 pounds gvw.

Truck-mounted backhoe digs to 15½-foot depth

The Cabot Corp. announces the Earthripper 5000, a fully hydraulic backhoe with ½-cubic-yard capacity, 15½-foot digging depth, and continuous 360-degree rotation.

The new machine has 180-degree action at the digging bucket, and the bucket is quickly changed from backhoe to shovel operation. Digging, shoveling, or backfilling buckets are available in various sizes.

The hydraulic system features a 125-gpm triple-tandem pump directly connected to a 320-cubic-inch gasoline engine. Diesel engines are available.

Cabot Corp., Machinery Division, Dept. C&E, Box 1101, Pampa, Texas. Circle No. 51 on Request Card that is bound into this issue.

Improved wax offered for snowplow blades

An improved snowplow wax, said to offer substantially longer service life, is announced by Speco, Inc.

Known as Snow-Rem Super, the wax is a combination of carnauba wax, silicone additive, and nonfreezing dryers. The manufacturer states that one coating will remain effective for up to 150 miles of plowing.

Speco, Inc., Dept. C&E, 7308 Associate Ave., Cleveland 9, Ohio. Circle No. 32 on Request Card.

Snow-melting compound requires no additives

Melts-It 99, a new ice and snow melting compound, is announced by the National Asphalt Corp.

According to the manufacturer, Melts-It 99 has no additives or fillers, and is especially effective at low temperatures. In addition, it is said to be suitable for thawing drains, gutters, downspouts, and sewers, and to mix readily with abrasives for large scale use.

National Asphalt Corp., Dept. C&E, P. O. Box 2275, Cleveland 9, Ohio. Circle No. 161 on Request Card.

Boring machine line for horizontal drilling

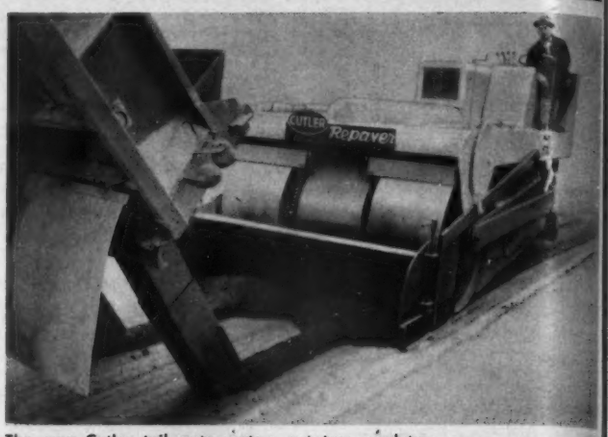
A new line of horizontal boring machines, capable of drilling horizontal or inclined holes from 6 to 60 inches in diameter and over 300 feet long, has been announced by Calweld, Inc.

Drilling speeds up to 2 fpm are possible.

The Calweld machine drives steel casings as it digs. It may also be used without drill head to jack concrete pipe.

A heavy-duty 120-hp engine with 4-speed transmission produces 15,000 to 19,000 foot-pounds of torque at the drill head. Massive hydraulic rams, actuated by a heavy-duty hydraulic 50-gpm pump produce up to 300 tons of thrust. Loose material is carried back to the work pit by auger-type flight conveyors.

Calweld, Inc., Dept. C&E, 7222 E. Slauson Ave., Los Angeles 22, Calif. Circle No. 111 on Request Card that is bound into this issue.



The new Cutler tail gate meters out two predetermined windrows of hot-mix in front of the finisher.

New tail gate designed for hot-mix operations

The Cutler Engineering Co. announces a new hot-mix dump-truck tail gate for use with the Cutler Repaver.

This specially designed unit meters out two predetermined windrows of hot-mix in front of the Rep finisher. The finisher then distribu this hot-mix to provide a smooth uniform ½-inch mat of seal coat. The new tail gate eliminates the hand labor from this operation.

Cutler Engineering Co., division of Asphalt Equipment & Engineering Co., Dept. C&E, 5435 W. 63rd. St., Chicago 38, Ill. Circle No. 55 on Request Card.

New stump-cutter is tractor-mounted

A tractor-mounted, pto-powered stump cutter, offered by Wagner Iron Works, reportedly features subsurface removal of tree stumps of any size in a matter of minutes.

The new unit, which mounts on any 3-point hitch tractor in the 42-drawbar-horsepower class, is hydraulically operated and controlled, and chews stump and root fibers at the rate of 12 inches per pass. The travel speed of the cutting wheel is adjustable up to 20 inches per minute.

Safety is assured through heavy steel shields and deflector plate. Wood chips average only thumbnail size and are usually backfilled into the hole, the company points out.

Total weight of the unit is about 1,300 pounds.

Wagner Iron Works, Dept. C&E, 1905 South First St., Milwaukee 1, Wis. Circle No. 115 on Request Card.

The Wagner PTO-powered stump cutter, shown mounted on an International tractor, is hydraulically operated and controlled.

The 3-yard bucket and 9-ton lifting capacity of a Trojan Model 304 tractor shovel have enabled Chambers Bros., Inc., of Garland, Texas, to convert a two-machine shot-rock loading operation to a one-machine job. The speed of the unit has also permitted the owners to utilize the machine in a topsoil loading operation almost one mile from the quarry, as well as to maintain all haul roads within the plant area. The rubber-tire tractor shovel loads the 15-yard semitrailers used to haul the topsoil in less than 2½ minutes. Yale & Towne Mfg. Co., Trojan Division, Main St., Batavia, N. Y. Circle No. 105 on Request Card.

Floor-type salamander rated at 150,000 Btu

The Insto-Gas Corp. announces the Insto-Hot No. 1412 LP-gas salamander.

The No. 1412 has a rated hourly capacity of 150,000 Btu at 100 psi. No pressure regulation is required as the salamander is connected to the fuel tank with high pressure.

According to the manufacturer, the unit burns without smoke, soot, or monoxide fumes.

Insto-Gas Corp., Dept. C&E, 998 E. Woodbridge, Detroit 7, Mich. Circle No. 135 on Request Card.

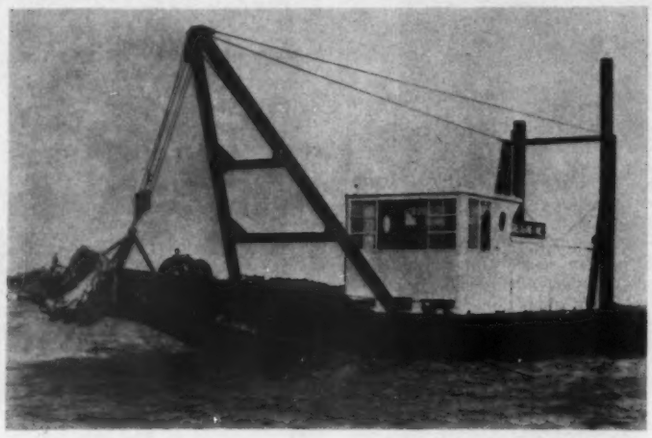
Two new models added to space-heater line

Two models of Herman Nelson heat generators are introduced by the American Air Filter Co. The HN 850 offers 125,000-Btu capacity, and the HN 2250 is rated at 300,000 Btu.

For safe and easy handling, all controls and handle are on the cool end of the machine.

Both units offer automatic ignition, automatic temperature control, and have stainless-steel combustion chambers.

American Air Filter Co., Portable Products, Dept. C&E, 215 Central Ave., Louisville 8, Ky. Circle No. 120 on Request Card.



Featuring 1,065 total hp, the new Ammco dredge has a top capacity of 300 cubic yards per hour and can pump to a distance of 4,000 feet.

Portable dredge pumps 300 yards per hour

A portable dredge with a capacity of 150 to 300 cubic yards of material per hour and a pumping distance to 4,000 feet is announced by American Marine & Machinery Co., Inc.

This dredge has two main engines driving the dredge pump and one auxiliary engine totaling 1,065 hp. It features Ammco's Hydra-Drive power system, which eliminates complicated mechanical systems and has less moving parts to maintain.

The dredge can be assembled in one day and transported by two trucks to any job site.

American Marine & Machinery Co., Inc., Dept. C&E, 201 Woodycrest Ave., Nashville 11, Tenn. Circle No. 131 on Request Card.

Concrete cylinder mold is lightweight unit

Forney's, Inc., announces a new lightweight concrete cylinder mold.

The unit is of 3-piece construction. The base plate is iron, and the two halves comprising the barrel are of aluminum alloy. The weight of the complete mold is 13 pounds.

All inside surfaces are accurately machined, and the wall thickness is said to be such that re-machining is possible without a dimensional increase beyond specification limits. The swing bolts have a cam action that forces the two halves apart for easy specimen removal.

Forney's, Inc., Tester Division, Dept. C&E, Box 310, New Castle, Pa. Circle No. 54 on Request Card.

Despite freezing temperatures, bricklaying continued in the construction of the Bond-Salisbury Elementary School in Louisville, Ky. Wooden frames were erected around the foundation of the school; sheets of clear plastic were spread over the frames; and the interior of the structure was kept warm through the use of Hy-Lo oil-burning salamanders. Wehr Constructors, Inc., Louisville, was the contractor. For further information on these salamanders, write to **Scheu Products Co.,** Dept. C&E, P. O. Box 262, Upland, Calif. Circle No. 101 on Request Card.

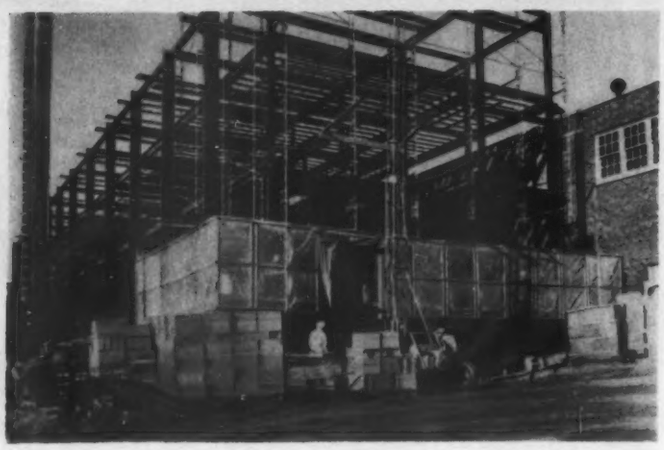
Compact portable heaters rated to 300,000 Btu

The Midland Products Co. offers portable heaters that are small and compact in size, and are rated at 120,-

000 to 300,000 Btu. The units are said to be safe and clean, with no outside vent.

For areas where electricity is not available, the 300,000-Btu model can be obtained equipped with a gasoline engine.

Midland Products Co., Dept. C&E, 181 Greenwood Ave., Midland Park, N. J. Circle No. 154 on Request Card.



An aid to cold-weather masonry construction, the Morgen enclosure system is designed to work with the firm's adjustable scaffolding. The enclosure for the entire wall is assembled at ground level and need not be dismantled until the wall is completed. As the platform rises with the building of the wall, it pulls up canvas from the roll or pile on the ground. The roof is formed by standard-size panels half the width of a bay of scaffolding; these panels, of polyethylene or canvas, can be used over and over again, the manufacturer points out. **Morgen Mfg. Co.,** Dept. C&E, P. O. Box 159, Yankton, S. Dak. Circle No. 127 on Request Card that is bound in this issue.

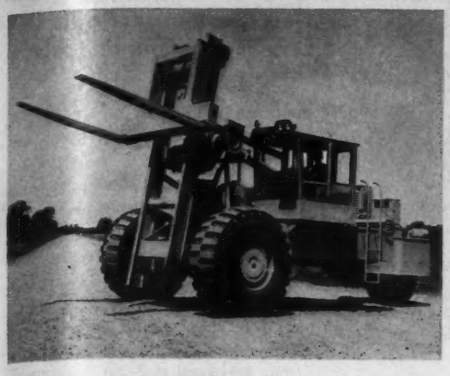
Portable pneumatic silo for storing bulk cement

Engineered Equipment, Inc., announces a new Nomad portable pneumatic silo for storing and handling bulk cement delivered by pneumatic haulers.

The standard basic unit has a 500-barrel fluffed rating, and will transfer material at the rate of 250 barrels or 500 barrels per hour, depending upon the compressor and pneumatic accessories used with it.

The unit is easy to erect and is self-supporting. No foundations are required. Available equipment provides extreme flexibility in setup and operating techniques, the manufacturer states.

Engineered Equipment, Inc., Dept. C&E, 1001 Linden Ave., Waterloo, Iowa. Circle No. 116 on Request Card.



This big new fork-lift is completely electric-powered and operates on paved or unpaved surfaces.

Introduce fork-lift with 20-ton capacity

A diesel-electric fork-lift that can handle up to 40,000-pound loads and that operates on either paved or unpaved surfaces has been introduced by R. G. LeTourneau, Inc. Electric-wheel drive and big wide-base tubeless tires provide flotation and traction for rough-terrain use.

The Series FLT-20 fork-lift truck is a 3-wheel unit and is powered by a 210-hp diesel engine driving ac and dc generators. All controls are governed by simple electric switches. The control console is part of a revolving seat assembly that permits the operator to swivel and face the direction of travel.

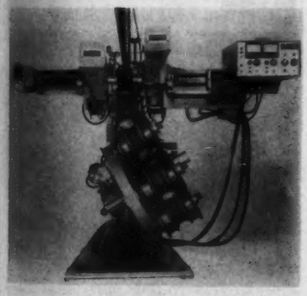
Over-all length, including forks, is 34 feet 9 inches, and the turning radius is 25 feet.

R. G. LeTourneau, Inc., Dept. C&E, 2399 S. MacArthur, Longview, Texas. Circle No. 36 on Request Card.

Roller-idler rebuilder is multiple-spindle unit

A new multiple-spindle roller-idler rebuilding machine is offered by the Stoody Co.

Known as Model MR, the unit features an offset main spindle support



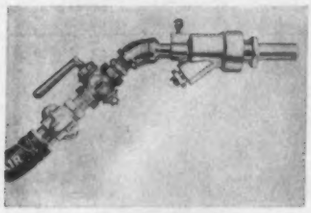
arm providing minimum head adjustment from tread to flange.

Other operating features include a columnized, easy-to-operate electronic control panel; full welding heads; wire straighteners; maintenance-free flux valves and shutoff mechanism; and a rugged carriage assembly that is engaged for directional travel by a simple 3-position lever.

This unit can be used with layer wound coils or 500-pound Payoffpaks. The system includes two 500-amp constant voltage, 100 per cent duty cycle power sources.

Stoody Co., Dept. C&E, 11904 E. Slauson Ave., Whittier, Calif. Circle No. 119 on Request Card.

New utility sandblaster for handling small jobs



A new vacuum-type utility sandblaster is offered by the Air Placement Equipment Co.

Called the Econo-Vac, it requires no elaborate setup and reportedly can be in operation in minutes with only an air source and a supply of abrasive or sand.

The blasting velocity and feed of abrasive is easily adjustable at the nozzle.

Air Placement Equipment Co., Dept. C&E, 1000 W. 25th St., Kansas City 8, Mo. Circle No. 48 on Request Card.

Portable steam cleaner is fully automatic

The Electro-Magic Model 100 steam cleaner is available from Electronics, Inc.

Mounted on four rubber wheels, the

unit is said to develop high-pressure steam in a little over a minute. A safety valve and visible steam gage are standard.

According to the company, Model 100 is fully automatic. It has large-capacity fuel and water tanks for many hours of continuous operation.

Electronics, Inc., Dept. C&E, Box 150, Vermillion, S. Dak. Circle No. 171 on Request Card.

Portable space heater produces 80,000 Btu

Stow Mfg. Co. offers an oil-fired, portable heater that can be modulated by the turn of a knob to produce from 20,000 to 80,000 Btu in a jet stream that throws the heat a distance of 25 feet.

The lightweight heater Model S80 is equipped with swing handles for lifting with one or two hands.

Light in weight and exceptionally portable, the Stow Model S80 starts instantly with the flick of a switch, the manufacturer states, while a thermal overrun device automatically cools the heater after shutoff.

Stow Mfg. Co., Dept. C&E, 443 State St., Binghamton, N. Y. Circle No. 149 on Request Card that is bound into this issue.

Adjustable locking lever for form filler strips

A new adjustable locking lever, designed to take the place of conventional scabbing-in when filler strips are used with Simplex forms, is offered by Simplex Forms System, Inc.

Made to overcome odd filler widths, the notched lever serves dimensions from ½ inch to 4 inches in ½-inch increments. The hardened steel lever slips over the Simplex alignment bolt and spans across the filler strip. It is then secured over the tie wire.

The lever is completely reversible, and is made to be used on inside or outside walls.

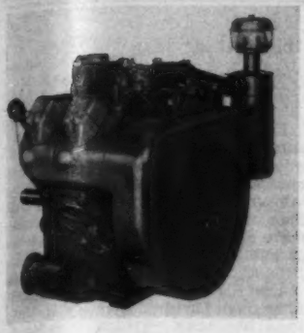
Simplex Forms Systems, Inc., Dept. C&E, 5611 Industrial Ave., Rockford, Ill. Circle No. 70 on Request Card.

New cleaner-oiler unit services pneumatic tools

A device designed to restore and maintain pneumatic tools at peak performance is available from the Marindus Co., Inc.

Called the Von Arx cleaner-oiler, it reportedly cleans and lubricates all kinds of air tools without the need for dismantling them. The unit is portable, and the length of time required to service an average tool is said to be about 3 minutes, with nonflammable solvents and light oils.

The Marindus Co., Inc. Dept. C&E, Box 286, Woodcliff Station, North Bergen, N. J. Circle No. 77 on Request Card.



Compact 60-hp engine designed for heavy duty

A new 60-hp, valve-in-head, air-cooled V-4 engine designed for heavy-duty applications in the construction field is announced by the Wisconsin Motor Corp.

Designated Model V-460D, the unit meets power requirements ranging from 36 hp at 1,400 rpm to 60.5 hp at 3,000 rpm, and develops 1650 inch/pounds torque at 1,600 rpm. It has a displacement of 154 cubic inches, features 7.1:1 compression ratio, and weighs 521 pounds dry.

Wisconsin Motor Corp., Dept. C&E, 1910 S. 53 St., Milwaukee 46, Wis. Circle No. 124 on Request Card.

Grouting admixture for prestressing

A combination retarding and expanding grouting aid said to be especially suited for prestressed concrete is announced by Sika Chemical Corp.

Known as Intraplast-C, this admixture is free from calcium chloride, nitrates or other chemicals that could potentially contribute to steel corrosion, according to the manufacturer.

Intraplast-C retains the water used in the mix, preventing formation of voids between tendons and encasing cables.

Sika Chemical Corp., Dept. C&E, Gregory Ave., Passaic, N. J. Circle No. 133 on Request Card.

Ripper tips, shanks are stronger, longer-wearing

New, improved tips and shanks for No. 8 and No. 9 tractor-mounted rippers have been announced by the Caterpillar Tractor Co.

Said to be stronger and longer wearing, the tips are of two configurations—one for high-impact applications, the other for use in highly abrasive material. Both are fabricated from alloy steel, hardened to Rockwell C50. They are made up of a forged base plate and a die-formed wrapper or boot, joined by a high-penetration weld. The base plate is of a channel section selected for its ability to resist bending without adding unnecessary weight.

The newly designed shank, designated Speed Shank, incorporates a slotted key design for mating tips to shanks.

Caterpillar Tractor Co., Dept. C&E, Peoria, Ill. Circle No. 59 on Request Card.

When a giant avalanche closed a Utah highway last March, trapping more than 200 people in the Brighton ski area, an Eimco Model 105 hydraulic dozer, equipped with a cold-weather cab, was rushed to the slide area, where it worked around the clock to open the road the next day. According to the manufacturer, the high mobility factor of the Eimco dozer, which has spin-turn capability and instant reversal with the power-shift feature of its Unidrive transmission, was important in getting this slide cleared away in record time. **The Eimco Corp.**, Dept. C&E, P. O. Box 300, Salt Lake City 4, Utah. Circle No. 86 on the Request Card.

Product Literature

To obtain free copies of any of the literature described in this section, circle the designated number on the Request Card.

Strand for prestress—Booklet on the properties and benefits of CF&I prestressed-concrete strand. Text is illustrated with table, and specifications are given.

Colorado Fuel & Iron Corp., Dept. C&E, Box 1920, Denver, Colo. **No. 163.**

Ice-control body—Bulletin describing the Baughman Model A1-SC auger-type ice-control body. According to the literature, this unit, said to be easily installed in a dump truck of any height, spreads salt, sand, or cinders on snow or ice-covered streets in any desired pattern up to 60 feet wide. Bulletin A-464.

Baughman Mfg. Co., Dept. C&E, 192 Arch St., Jerseyville, Ill. **No. 89.**

Impact crushers—Brochure discussing the operating features of new Lippmann single and double-rotor impact crushers. Illustrated; gives condensed specifications of all sizes available. Bulletin 1170.

Lippmann Engineering Works, Dept. C&E, 4603 W. Mitchell St. Milwaukee 14, Wis. **No. 19.**

Snow vehicle—Bulletin on the Snow-Trac, a Swedish-built vehicle for the transportation of men and materials over snow and soft ground. Contains specifications and is illustrated with photographs.

Bashaw Equipment Co., Inc., Dept. C&E, P. O. Box 1999, Anchorage, Alaska. **No. 90.**

Forms for prestress—Brochure on the Watco line of steel forms for precast, prestressed concrete. Describes and illustrates forms for a wide variety of shapes.

Watco Steel Forms, Div. of Plant City Steel Corp., Dept. C&E, P. O. Box 1308, Plant City, Fla. **No. 117.**

Portable megaphone—Literature on the Model S-183 Super Hailer, a transistor-powered portable megaphone featuring a detachable microphone to permit wide flexibility of applications. Includes specifications and price information.

Audio Equipment Co., Inc., Dept. C&E, 75 Harbor Road, Port Washington 41, N. Y. **No. 118.**

Forms for street paving—Brochure on a completely standardized, interchangeable Blaw-Knox system of steel forms for street paving. Highlights curb-and-gutter, flexible or fixed-radius, straight or battered-curb, and sidewalk forms, as well as details and accessories. Booklet No. UF-100.

The Blaw-Knox Co., Construction Equipment Division, Dept. C&E, Mattoon, Ill. **No. 6.**

Roller, idler rebuilder—Data on the dual-head Micro-Matic, a completely automatic machine designed for hard-metal resurfacing of tractor, crane, or shovel rollers, idlers, and wheels. Contains illustrations and a

Explosives—Fact sheet discussing the benefits of Hercules Flogel and Flogel HD non-nitroglycerin explosives said to provide high loading densities where concentrated loads are needed.

Hercules Powder Co., Dept. C&E, 910 Market St., Wilmington 99, Del. **No. 66.**

Snowplows—Literature on Valk one-way and reversible snowplows. Gives specifications for both types, and includes illustrated data on the firm's universal hitches.

Valk Mfg. Co., Dept. C&E, Carlisle Turnpike, Carlisle, Pa. **No. 87.**

Multiple-element switches—Literature describing Synchro-Start 4, 5, or 6-element speed-sensitive switches. Each switch has independent normally open and normally closed contacts rated for 10 amp at 115 volts ac, and is adjustable within its range. Bulletin No. 604.

Synchro-Start Products, Inc., Dept. C&E, 8151 N. Ridgeway Ave., Skokie, Ill. **No. 82.**

Bearings—Booklet entitled "Bearing Parts and Nomenclature of Standard and Precision Bearings." Covers ball installation, dimensions, loads, alignment, types, and functions of self-aligning, non-self-aligning, and thrust bearings. Bearing accessories also described. Form No. 343.

SKF Industries, Inc., Dept. C&E, Front St. and Erie Ave., Philadelphia 32, Pa. **No. 80.**

convenient reference chart of hard-surfacing wires. Bulletin MI-402.
Automatic Welding Co., Dept. C&E, 1005 Liberty Ave., Pittsburgh 22, Pa. **No. 10.**

Automatic clutch—Folder on Power-Max automatic, adjustable centrifugal clutches. Gives application classes and ratings, plus specifications and dimensions for direct-drive, V-belt, and flat belt-type units.
Olme Precision, Inc., Dept. C&E, 392 Masonic Bldg., Portsmouth, Ohio. **No. 13.**

Dryer-capacity calculator—Dryer-capacity calculator designed to assist asphalt-plant owners and operators in the selection of the proper aggregate drying equipment to suit their specific requirements.
Barber-Greene Co., Dept. C&E, 400 N. Highland Ave., Aurora, Ill. **No. 47.**

Wire for prestress—Brochure on CF&I stress-relieved prestressed-concrete wire. Discusses mechanical properties and applications. Illustrations, specifications included.
Colorado Fuel & Iron Corp., Dept. C&E, P. O. Box 1920, Denver, Colo. **No. 88.**

Welding—Handbook on welding low-alloy high-tensile steels. Contains pertinent information on most types of low-alloy, high-tensile steels, including chemical analyses and physical properties. Electrode recommendations given.
Alloy Rods Co., Dept. C&E, P. O. Box 1828, York, Pa. **No. 81.**

Concreting equipment—Catalog covering the Gar-Bro line of concrete handling and placing equipment. Includes guide to concrete handling and placing methods and the selection of proper equipment for all job conditions and concrete specifications.
Gar-Bro Mfg. Co., Dept. C&E, 2415 E. Washington Blvd., Los Angeles 21, Calif. **No. 133.**

Drills, sampling equipment—Catalog covering Mobile Drilling's complete line of hydraulic-powered drill rigs, tools, and accessories. Fully illustrated, it gives detailed descriptions, including specifications, on over 1,900 items related to rotary drilling and soils exploration. Catalog No. 615.
Mobile Drilling, Inc., Dept. C&E, 1244 N. Cornell Ave., Indianapolis, Ind. **No. 4.**

Brush cutter—Illustrated literature featuring the Rowco Brushking Model 660. Gives specifications, as well as data on a variety of accessories. Form No. 217P.
Rowco Mfg. Co., Inc., Dept. C&E, 48 Emerald St., Keene, N. H. **No. 5.**

Shoring—Illustrated bulletin giving detailed information on Rex-Spanall horizontal, adjustable, telescopic steel shoring designed to provide versatility and speed in all types of poured slab construction. Bulletin No. 61305P.
Rex-Spanall, Inc., Dept. C&E, 6427 W. Capitol Drive, Milwaukee 16, Wis. **No. 61.**

Compressor—Brochure illustrating and describing the Model 75 Porta-Air compressor. Gives specifications for both trailer and skid-mounted models. Also furnishes data on the smaller Porta-Air Model 60.
General Supply Co., Industrial Compressor Division, Dept. C&E, 1920 McGee Trafficway, Kansas City Mo. **No. 41.**

Rock reducer—Folder listing the benefits of the Pulvo-Matic rock reducer, which features a single moving part said to save power, cut maintenance costs, and reduce downtime. Drawings and photographs.
The Frog, Switch & Mfg. Co., Manganese Steel Casting Division, Dept. C&E, P. O. Box 431, Carlisle, Pa. **No. 91.**

Rock tongs—Brochure on McCaffrey rock tongs. On-the-job photos; detailed, easy-to-read specification chart.
M. P. McCaffrey, Inc., Dept. C&E, 2121 25th St., Los Angeles 58, Calif. **No. 11.**

Pumps—Bulletin on Rex AGC line of self-priming centrifugal pumps offered in capacities from 5,000 to 90,000 gph. Illustrations; specifications.
Chain Belt Co., Construction Machinery Division, Dept. C&E, 4701 W. Greenfield Ave., Milwaukee, Wis. **No. 22.**

Dryer units—Illustrated catalog describing portable and stationary electric-motor or combustion-engine-driven dryer units with medium to large capacity range. Bulletin AP-28.
Iowa Mfg. Co., Dept. C&E, Cedar Rapids, Iowa. **No. 9.**

Wire-rope slings—Illustrated bulletin describing Brown & Perkins wire-rope slings and swaged assemblies. Contains specifications on the company's complete line of Loadguard rope-laid, cable-laid, and braided

slings including rated capacities in tons, size, width, thickness, finished body diameter, and inside diameter of the loop size. Bulletin 401.

Brown & Perkins, Inc., Dept. C&E, 675 New Brunswick Ave., Perth Amboy, N. J. **No. 93.**

Concrete specialties—Catalog of special interest to precast and prestress producers. Describes and illustrates the R. L. Spillman line of metal forms and machinery for concrete specialty products.

R. L. Spillman Co., Dept. C&E., Box 534, .Station G., Columbus 7, Ohio. **No. 21.**

Reducing camber variations—Literature describing the "filled-gap" method of reducing camber variations between adjacent double tees. Includes tables of safe superimposed loads for a 4-inch-thick-flange double tee having 1, 2, or 3-foot spaces between members, along with an alternate method using only a 2-inch-thick flange. Newsletter No. 888.

Leap Associates, Inc., Dept. C&E, P. O. Box 495, Lakeland, Fla. **No. 71.**

Bituminous distributor—Bulletin describing Model RHU road-oil distributor in 800 and 1,000-gallon capacities with a choice of three styles of spraybars. Bulletin No. 566-B.

Rosco Mfg. Co., Dept. C&E, 3118 Snelling Ave., Minneapolis, Minn. **No. 39.**

Long-range excavator—Catalog providing general information on Sauerman slackline cableway machines. Covers specifications, operational data, and applications to which these machines are suited.

Sauerman Bros., Inc., Dept. C&E, 620 S. 28th Ave., Bellwood, Ill. **No. 60.**

Pipe—Folder describing Durmanit asbestos-cement pressure pipe with the Reka coupling. Illustrated; specifications included.

Write to American Mannex Corp., Dept. C&E, 680 Fifth Ave., New York 19, N. Y. **No. 65.**

Snow-moving equipment—Booklet describing the role of Caterpillar wheel loaders in moving snow. Stresses such features as front dumping or side-bucket dumping. Form D119.

Caterpillar Tractor Co., Dept. C&E, Peoria, Ill. **No. 109.**

Water liners—Bulletin describing and illustrating several models of Fibre-Metal safety hat and cap liners. Head-size chart. Bulletin No. 67.

The Fibre-Metal Products Co., Dept. C&E, Fifth and Tilghman Sts., Chester, Pa. **No. 24.**

Cutting edges, end bits—Brochure illustrating and describing the Esco line of cast-alloy cutting edges for scrapers, dozers, and graders. Also gives data on end bits, router bits, and earthmoving accessories. Catalog 212-A.

The Esco Corp., Dept. C&E, 2147 N. W. 25th Ave., Portland, Ore. **No. 76.**

Calcium chloride—Manual on the use of calcium chloride for abrasive treatment in winter maintenance. Includes data on calcium chloride, recommended procedures for treating, storing, applying, and spreading abrasives.

Calcium Chloride Institute, Dept. C&E, 909 Ring Bldg., Washington 6, D. C. **No. 74.**

Pumps—Brochure on the complete Chicago line of vertical, enclosed-shaft, nonclog VCS pumps with capacities from 50 to 5,000 gpm and heads to 105 feet. Specifications and illustrations. Bulletin No. 124-G.

Write to Chicago Pump, Dept. C&E, 622 Diversey Parkway, Chicago 14, Ill. **No. 63.**

Pipe-laying manual—Pocket-size manual listing the step-by-step procedure for laying concrete pressure pipe. Contains photographs, detail drawings, deflection data, current tables of pipe sizes, and a full list of supplies and equipment needed for the job.

Write to Price Bros. Co., Dept. C&E, 1932 E. Monument Ave., Dayton 1, Ohio. **No. 207.**

Steel forms—Catalog discussing Efco steel forms for concrete construction. Describes and illustrates wide variety of construction projects on which these forms are particularly suitable. Pictures various sizes and styles of form panels, accessories, supplies, and tools.

Economy Forms Corp., Dept. C&E, Box 128-E, Highland Park Station, Des Moines, Iowa. **No. 110.**

Engine pre-heaters—Literature listing the benefits of Kim Hotstart electric pre-heaters for diesel and gasoline engines. Specifications furnished.

Kim Hotstart Mfg. Co., Dept. C&E, W. 917 Broadway, Box 42, Spokane 10, Wash. **No. 42.**

Sheepsfoot—Fact sheet on three models of American Steel sheepsfoot rollers—the ADC-120, FDB-120, and the RD-144. Close-ups of component parts. Specifications. Bulletin No. 161.

American Steel Works, Dept. C&E, 1211 W. 27th St., Kansas City 8, Mo. **No. 40.**

Cleaning solvent—Literature discussing the benefits of Tar-X, a solvent that may be sprayed, painted, or mopped on asphalt distributors and other road equipment; deposits are then hosed off with clear water and pressure hose.

Certified Laboratories, Dept. C&E, P. O. Box 2493, Fort Worth, Texas. **No. 100.**

Truck crane—Catalog on the Insley 35-ton truck-mounted crane. Contains on-the-job photographs, upper-works specifications, crane-boom data, and line speeds and pulls information. Catalog No. 200-35.

Insley Mfg. Corp., Dept. C&E, P. O. Box 167, Indianapolis, Ind. **No. 8.**

Circle the numbers indicated to obtain catalogs described here.

Labor factors affecting production

by GEORGE E. DEATHERAGE, P. E.
construction consultant

The contractor of today, because of the great improvement in communications and transportation, works farther and farther away from his home base. The farther away he is from that base, the more unfamiliar to him are the many intangibles, or indirect items, to be allowed for in job costs. But these intangibles—items other than the labor and materials entering into the permanent part of the work—cannot be ignored, for they may soak up projects like a sponge.

Labor factors, a group of over-all management factors for a contractor to consider in the prebidding stage as influencing estimated production and unit costs, include:

1. Local labor conditions
2. Local job conditions
3. Efficiency of local supervision
4. Weather forecasts
5. Short or long-time job
6. Specification requirements, inspection
7. Local job delays
8. Economics of the times

Local labor conditions

Today, because of the slimness of present profit margins, it is important that the contractor spend more time and effort in gaining accurate and reliable knowledge of local labor conditions before bidding.

Always to be considered is the over-all available supply of labor and mechanics. In addition to this, certain areas will have a general reputation relative to labor-management relations. In an area with a history of constant and recurring jurisdictional disputes or labor-management friction, the over-all manpower efficiency will drop. In other areas, featherbedding, such as has resulted in the recent scandals at missile-launching sites, can bankrupt a contractor in short order.

Prebid conferences with local labor leaders are essential so that the contractor can become familiar with expected labor conditions and settle any possible jurisdictional disputes that might arise. The contractor should finally determine the percentage to be added to or subtracted from his norm of unit prices or production figures.

To be considered within this category are transportation facilities, communications, housing, parking, reliability of local power sources, and even local politics. Lack of knowledge of these conditions may mean the difference between a profit and a loss.

On one large job, for instance, the source of electrical power was so overloaded that it resulted in constant and recurring power failures lasting from a few minutes to several hours.

Local taxes imposed, stringent enforcement of local ordinances as to truck routes, etc., are a few of the many things that can cost a job money if not anticipated.

Local supervision

The contractor should know to what extent local supervision is available and efficient. He should also be aware of what craft union rules bear on the matter of required supervision, the expense of job stewards, allowances for travel time, etc.

Allowances must be made for winter protection; for ice, cups etc., in hot weather; and for excessive rainfall. The contractor should check areas that are planned for storage of materials outside. He should know the requirements of the terrain; whether natural drainage will suffice, or whether ditching or pumping will be required. He should also know the condition of the roads, and should be familiar with union rules. In case of enforced job shutdown, he should know if union rules require full-shift pay for minimum hours worked. If weather conditions are unfavorable, he should know if craft rules require pay for reporting to the job —unless they are notified of no work. And he should be familiar with crafts that require standby pay.

Short or long-time job

It requires as long to get on and off a short-time job as it does the long-time one. On road work, the contractor often does not take this fact into consideration, and thus underestimates. Here, estimating the plant expense as a percentage of the total job cost does not work.

Other factors to be considered under this item are transportation, temporary road expense, communications, temporary housing, and availability of labor.

The contractor should know how tough the job specifications are and how rigidly they will be enforced. He should make sure the drawings and specifications are clear and definite and should find out if there will be additional expense in submitting material samples. He should know if the inspection might have any political overtones, and whether any of the crafts need to be prequalified.

Local job delays

Expense in this category may be encompassed within the 50-minute-hour rule—that minor delays, slowdowns, contingencies, etc. will result in production only 50 minutes of the hour. This gives an efficiency of 83.3 per cent.

On foreign construction projects, it is useful to know national holidays.

Economics of the times

Labor will produce more in poor times when jobs are scarce and less when jobs are plentiful. This factor has an influence on all the other

Construction Camera

Dragon teeth, painted on the jaws of an International Drott TD-15 Four-in-One, emphasize the rig's big bite as it digs out 1,000 feet of ditch for the installation of new culverts near Rock, Mich. The Delta County Road Commission, owner of the equipment, is working alongside Route M-35.

An 8-mile storm-sewer tunnel beneath the new South Chicago Expressway is constructed of steel-reinforced concrete over structural-steel ribbing. A man installs a 12-inch Junior Channel section, made by Jones & Laughlin. Channels are bolted together at plates welded at the ends.

management

labor factors mentioned, and should be given careful consideration.

How much the labor factors will affect optimum production varies in every case. The average 50-minute-hour production of an efficiency at 83 per cent might be considered as 100 per cent. From this, a conversion factor that covers all others can be applied in an attempt to arrive at a real efficiency factor applicable to any particular job under analysis. This figure will be less than the stated 83 per cent in the measure that the other factors bear on it.

A study of cost figures on a fair number of contractors showed that where losses were incurred, a great many of them were due to the intangible items that silently soaked up profits. These are the complexities of which contractors complain today; but these are complexities because they have hitherto been ignored or underestimated. THE END

This barge is used for making heavy lifts—handling anchors, cable, and chain—during construction of the Hood Canal floating bridge being built at Port Gamble, Wash., by Yuba Erectors Division. The barge is equipped with a Skagit BU-140-YD, one of 11 Skagit hoists rented for the project, which is nearing completion.

Floodlights—182 of them—illuminate the John Day Lock and Dam, a Columbia River project. Montag-Halvorson-McLaughlin & Associates fastened Wide-Lite mercury vapor lamps on skid-mounted towers, which are towed about, and mounted four of the lights on each gantry boom. Despite rough treatment, the lamps stood up well.

Symons builds showcase factory-office buildings

■ Latest methods of poured-in-place concrete forming are being prominently displayed in the new office building and factory of Symons Clamp & Mfg. Co., Chicago, Ill. Construction on the two showcase buildings began recently in suburban Des Plaines.

One example will be the use of Symons' system of ganging its prefab panels for placement of architectural concrete walls. Ganged sections varying in size from 30 × 12 to 25 × 12 will be tied together on the ground and craned into place, then re-used as the need arises.

Another of the firm's products will be used in placing ceilings and second-story floors for the office building—a new method of deck forming in which, by using a new kind of shore and stringer, most of the usual scaffolding is eliminated.

The factory is scheduled for November completion; the office building for early January. R. Thomas Milord of Chicago is the contractor.

A HUGE, STEAM-DRIVEN PILE DRIVER hammers a section of heavy-gage electric-weld steel pipe into the ground at San Francisco International Airport. Some 685 steel piles, averaging 100 feet in length, will provide the foundation of the new $8 million South Terminal Building. After a pipe section is driven to its full length, a corrugated shell is attached to the top, and the hammer continues driving the pipe. When bedrock is reached, the hammer is withdrawn, and the tube is ready to be filled with concrete to form a solid pile. The corrugated sections were fabricated by Raymond Concrete Pile Co., the general contractor; the Kaiser Steel pipe piling was supplied by L. B. Foster.

Index to Advertisers

Product literature in October advertisements

The following free catalogs, bulletins, and other specific literature are offered by manufacturers advertising in this issue and whose advertisements were in our hands by September 15. To obtain any item, circle the designated number on the Request Card.

Concrete forming—Catalog 761 discussing Universal products for concrete construction. Also discusses the firm's comprehensive engineering service. Universal Form Clamp Co. Circle No. 173 on Request Card.

Speed switches—Bulletin No. 604 explaining how a speed switch works. Synchro-Start Products. Circle No. 172 on Request Card.

Hydraulic pumps, jacks—Bulletin 242-B discussing Farrel Watson-Stillman hydraulic jacks and pumps. Full details and specifications. Circle No. 202 on Request Card.

Concrete accessories—Bulletin PR-2 describing the Superior line of accessories for use with precast and prestressed concrete. Circle No. 200 on Request Card.

Hoist support—Brochure containing data and prices for the Magic-Pole universal-gantry hoist support, available in 5 models. B. E. Wallace Products. Circle No. 204 on Request Card.

Pumps—Bulletin CH-61 on the complete Marlow line of pumps designed for a wide variety of applications. Circle No. 203 on Request Card.

Pumps—Descriptive literature on the Barnes new SPC line of contractors' pumps, including specifications and performance data. Circle No. 198 on Request Card.

Dump trailers—Information on the Trailmobile line of dump trailers and hoppers. Circle No. 196 on Request Card.

Platform trailers—Descriptive literature on platform trailers offered by Trailmobile. Units feature interchangeable side panels for conversion to open-top trailers. Circle No. 194 on Request Card.

Lubricants—"Lubriplate Data Book" on the lubrication needs of construction machinery, and recommended practices. Fiske Bros. Refining Co. Circle No. 201 on Request Card.

Space heater—Catalog No. 601 on the Stow Model S-100 portable space heater offered in capacities from 100,000 to 1 million Btu per hour. Circle No. 195 on Request Card.

Low-bed trailers—Folders covering Trailmobile's line of low-bed trailers, with standard units to 75-ton capacity and special units for heavier loads. Circle No. 197 on Request Card.

High-pressure washers—Data on Champion high-pressure washers for equipment cleaning. Circle No. 206 on Request Card.

Hydraulic jacks—Bulletin J-1031 on Rodgers hydraulic jacks, 50 to 600 tons, manual or powered, single or double-acting. Circle No. 192 on Request Card.

Pipe—Bulletin No. 59 detailing the benefits of Naylor Spiralweld pipe and Wedgelock couplings. Circle No. 191 on Request Card.

Steel products—Catalog G-104 detailing the CF&I line of steel products for a wide range of construction uses. Colorado Fuel & Iron Corp. Circle No. 183 on Request Card.

Roller chain—Folder giving construction details, specifications, and price information on Tuf-Flex roller chain for heavy-duty equipment. Diamond Chain Co. Circle No. 188 on Request Card.

Welding rectifiers—Pamphlet "Rectifiers for Welding," describing the application of various Miller Electric units for multipurpose welding. Circle No. 190 on Request Card.

Castings—Catalog illustrating and listing some 15,000 patterns for gray and ductile iron castings. Neenah Foundry Co. Circle No. 189 on Request Card.

Hour meters—Catalog No. 60 illustrating the Hobbs line of industrial hour meters and other electric timing instruments. Circle No. 185 on Request Card.

Trash pumps—Catalog PT-1 on 3 and 4-inch PosiJector self-priming centrifugal trash pumps. The Jacuzzi Machine Co. Circle No. 187 on Request Card.

Bearings—Illustrated catalog on Monmouth aluminum engine bearings. Circle No. 186 on Request Card.

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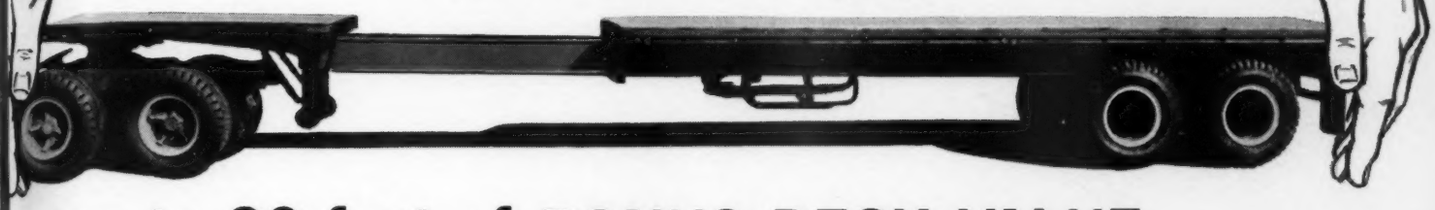

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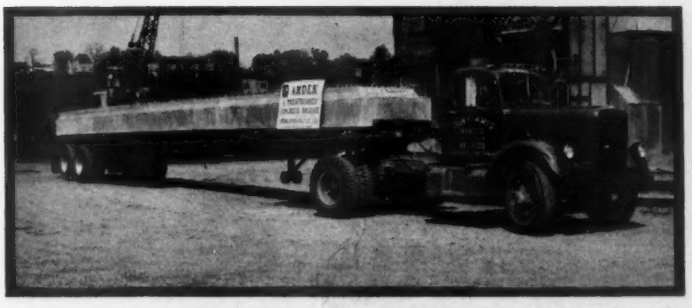

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